89.

AIDS TO OTOLOGY



W. R. H. STEWART

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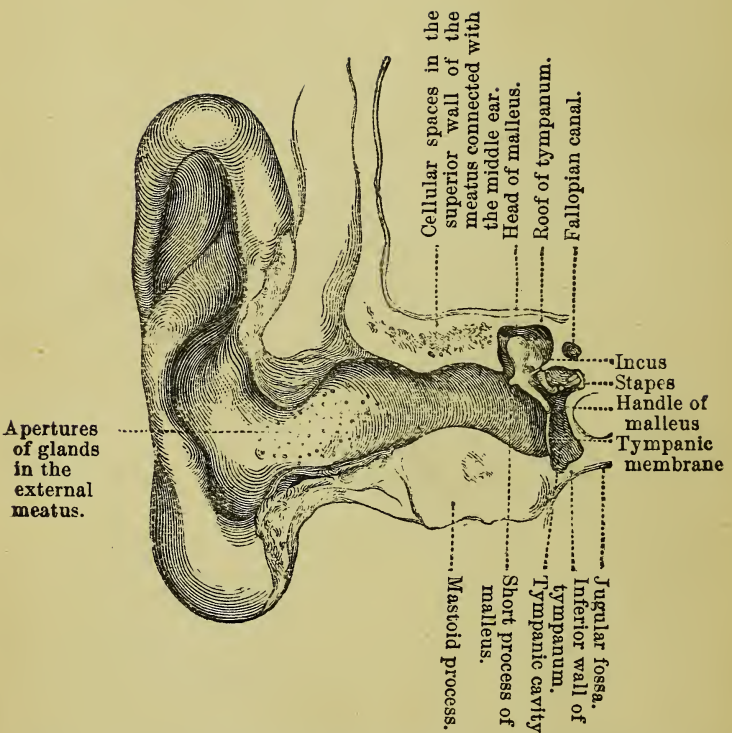


FIG. 1.—Vertical section of external meatus, tympanic membrane, and tympanum.

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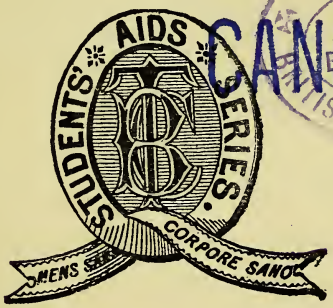
(SECOND EDITION OF 'EPITOME OF EAR DISEASES').

BY

W. R. H. STEWART, F.R.C.S.E.

AURAL SURGEON TO THE GREAT NORTHERN CENTRAL HOSPITAL; SURGEON TO THE LONDON THROAT HOSPITAL; LATE SURGEON TO THE THROAT HOSPITAL, GOLDEN SQUARE; AND SURGEON-IN-CHARGE OF THE EAR AND THROAT DEPARTMENT, NORTH-WEST LONDON HOSPITAL.

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PREFACE.

THAT this little work, under the title of 'Epitome of Ear Diseases,' ran through the first edition in three years is, the author thinks, ample proof of its usefulness and its appreciation by the profession. The book has been almost rewritten, to bring it abreast of the advances made in this branch of surgery, and the author trusts that, under its new title, it will prove even more successful, and be a veritable aid to otology.

It should be distinctly understood that this book is in no way intended to take the place of the larger works on ear-disease.

W. R. H. STEWART.

42, Devonshire Street, Portland Place,
October 1, 1893.

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AIDS TO OTOLOGY

CHAPTER I.

ANATOMY OF THE EAR.

Divided into—External, Middle, Internal.

The **EXTERNAL EAR.**—Comprises the pinna or auricle, and the external auditory meatus.

The **AURICLE.**—A trumpet-shaped expansion attached to the side of the head by muscles, skin, etc. It is made up of elevations and depressions arranged so as to collect the sound-waves and conduct them into the external meatus.

These elevations and depressions consist of—

The Concha.—A depression surrounding the opening of the external auditory meatus.

The Tragus.—A prominence in front of the concha, projecting backwards over the external auditory meatus.

The Anti-Tragus.—A prominence more posterior and separated from the former by the notch.

The Lobule.—Pendulous portion below the anti-tragus.

The Anti-Helix.—A curved ridge starting from the anti-tragus and surrounding the concha.

The Fossa of the Helix.—The depression between the anti-helix and the helix.

The Helix.—The thin margin which surrounds the pinna, starting from just above the tragus and losing itself in the lobule.

Structure.—It is composed of yellow fibro-cartilage enclosed in a delicate skin. The lobule contains no cartilage.

Blood Supply.—The posterior auricular artery, from the external carotid.

The anterior auricular artery, from the temporal.

Small branch, from the occipital.

Nerve Supply.—The great auricular, from the cervical plexus.

The posterior auricular, from the facial.

The auricular temporal, from the third division of the fifth.

The **EXTERNAL AUDITORY MEATUS.**—A canal leading from the bottom of the concha to the tympanic membrane.

Direction.—First upwards and inwards, then downwards and inwards.

Length.—About one inch.

The floor is slightly longer than the roof, and the anterior wall than the posterior, due to the oblique insertion of the tympanic membrane.

Slightly contracted at the opening, the canal expands, to contract again at the junction of the cartilaginous and osseous portions (the narrowest part of the tube), once more expanding as it is continued to the tympanic membrane.

Structure.—Cartilaginous in its outer one-third (an extension of the auricular cartilage), bony remaining two-thirds. It is covered with a very fine, delicate skin, continuous with that of the auricle, and this, stretching over the tympanic membrane, forms the external layer of that structure.

The cartilaginous portion is deficient at the upper and posterior parts, where it is filled in with fibrous tissue. It is traversed by the fissures of Santorini, also filled with fibrous tissue. These help to straighten the meatus during examination, etc. Hairs guard the entrance; and glands, deep in the cartilaginous portion, secrete a wax which moistens the integuments. Superficial glands are sebaceous.

The roof is under the middle fossa of the skull, and the posterior wall is in front of the mastoid cells.

Blood Supply.—Branch of the internal maxillary artery.

Nerve Supply.—Auricular branch of the pneumogastric and the auriculo-temporal.

The **MEMBRANA TYMPANI.**—*Situation.*—The partition between the external and middle ear, is inserted obliquely at the inner end of the external meatus.

Colour.—A delicate pearly grey, highly polished.

Shape.—Nearly circular, slightly concave externally and convex internally.

Structure.—Three layers. An *external*, or *dermoid*, a fine skin continuous with that of the external meatus. A *middle*, or *fibrous*, consisting of: (1) External fibres, radiating towards and fixed to a cartilaginous structure,* attached to the posterior part of the handle of the malleus, loose at the upper part, firm below. (2) Internal circular fibres, which form a dense ligamentous ring. This layer is attached to a ridge of bone, deficient above, and across this notch is stretched the external and internal layers only, the middle being absent; this part is called the *membrana flaccida*, or *Shrapnell's membrane.* The relaxing and sphincter action of these two sets of fibres preserves a balance of power when the drum-head is in a state of rest, and explains its peculiar concavo-convex shape (Helmholtz). An *internal*, or *mucous*, continuous with the mucous lining of the tympanum.

Landmarks to be noted in the Membrane.

Short process of the Malleus is near the upper border.

The *Handle* projects downwards and backwards from the short process to a point somewhat below the middle line of the membrane.

Shining Spot.—A triangular reflection of light, base downwards, extending downwards and forwards from the lower end of the handle. Due to a cone-shaped depression in this situation.

Anterior and *Posterior Folds of Membrane.*—Ridges extending forwards and backwards from the short process of the malleus to the periphery.

* A residue of the stage of development when the entire malleus was cartilaginous (Gruber).

Blood Supply.—External layer: *deep auricular branch of the internal maxillary.*

Internal layer: *tympanic vessels.*

Nerve Supply.—External layer: *a branch of the fifth.*

Internal layer: *tympanic plexus.*

The **MIDDLE EAR.**—Comprises the tympanum, its contents, and communications.

The **TYMPANUM.**—*Shape and Situation.*—A small irregular six-sided cavity in the substance of the temporal bone.

Size.—The *antero-posterior* measurement, the longest, is from a quarter to half an inch. *Depth* from within out, from one to two lines.

The WALLS.—The ROOF, the FLOOR, the ANTERIOR and POSTERIOR, are thin layers of bone separating the cavity from the cranial contents, the internal jugular vein, the internal carotid artery, and the mastoid cells, respectively. The Eustachian tube opens into the anterior.

The EXTERNAL.—A ring of bone and the membrana tympani.

The INTERNAL.—Formed by the labyrinth, is irregular; in it are—

The *Fenestra Ovalis.*—An ovoid opening, near the upper and posterior part, leading into the vestibule, closed by the lining membrane and the base of the stapes.

The *Aqueductus Fallopii.*—A ridge of bone containing the facial nerve, situated just above the fenestra ovalis.

The *Promontory.*—A smooth bony projection containing the first turn of the cochlea, situated below the fenestra ovalis; grooved for the passage of the tympanic nerves.

The *Fenestra Rotunda.*—A round opening below and behind the promontory, leads to the scala tympani of the cochlea, closed by a membrane—the secondary tympanic membrane.

Contents.—The ossicles, their ligaments and muscles; the chorda tympani nerve.

The OSSICLES.—A chain of small bones crossing the tympanum; three in number—the Malleus, the Incus, the Stapes.

The *Malleus*, or *hammer*, consists of a handle or manubrium, a central portion, and two processes.

The *manubrium*, or *handle*, runs downwards and backwards to below the middle of the tympanic membrane.

The *short process*.—A low conical eminence situated at the root of the handle.

The *long process* runs from the junction of the handle and central portion downwards and forwards into the Glasserian fissure.

The *central portion* articulates by a smooth depression (*the head*) with the next bone—the incus.

The *Incus*, or *anvil*, sometimes called the *Dens mollaris*, situated behind the malleus, consists of a body and two processes.

The *body* articulates with the malleus.

The *short process* runs backwards to the posterior wall of the tympanum, to which it is connected by ligamentous fibres.

The *long process* is directed downwards and articulates with the stapes.

The *Stapes*, or *stirrup*, consists of—

The *head*, articulating with the long process of the incus.

The *neck*, receiving the insertion of the stapedius muscle.

The *base*.—An oval plate of bone attached to the margin of the fenestra ovalis.

The *cruræ*, the anterior of which is the shorter and straighter, diverge from the neck and are attached to the outer surface of the base, near its extremities.

The Ligaments.—The ossicles are held together and in position by ligaments.

The Muscles.—Two in number—the tensor tympani and the stapedius.

The *Tensor Tympani*.—Arising from the cartilaginous end of the Eustachian tube and adjoining bony wall, is inserted into the inner part of the handle of the malleus.

Action.—Prevents the membrane being pushed too far out, renders it more tense when the muscle contracts, and hence has been supposed to act as a damper, lessening the amount of vibrations of the membrane in the case of too-powerful sounds, or as a mechanism of accommodation, altering the membrane to the sounds that fall upon it. The muscle, actively regulated

by reflex action, is in some persons under the dominion of the will, as evidenced by the peculiar crackling sound they hear.

The *Stapedius.*—Arising from the hollow of the pyramid, is inserted into the neck of the stapes, posteriorly.

Action.—Regulates the movements of the stapes, especially preventing the base being driven too far in during large and sudden movements of the tympanic membrane.

The CHORDA TYMPANI runs through the tympanum on a level with the upper margin of the tympanic membrane, passing, in its course, between the malleus and incus.

Blood Supply.—The internal carotid, middle meningeal stylomastoid, ascending pharyngeal.

Nerve Supply.—The tympanic plexus; composed of Jacobson's nerve of the glosso-pharyngeal; carotid plexus of the sympathetic; branch of the great superficial petrosal; small superficial petrosal of the otic ganglion.

Communications.—The Eustachian tube in front, communicating with the outer air. The mastoid cells.

The EUSTACHIAN TUBE runs from the cavity of the tympanum forwards, inwards, and downwards to the pharynx, where it ends in a trumpet-shaped opening with a prominent posterior lip, situated behind the inferior meatus of the nose, above the palate level.

Size.—The osseous portion about half an inch, the cartilaginous and membranous about one inch long. The narrowest part is at the junction of the cartilaginous and osseous portions.

Structure.—Partly osseous, partly cartilaginous and membranous. This latter portion is cartilaginous in its internal, superior, and partly external aspect; the remainder being membranous; it is lined with a ciliated mucous membrane. There are numerous glands towards the pharynx.

Muscles.—Three in number—the tensor palati, the levator palati, and the salpingo-pharyngeus. These, acting on the lower part of the tube, which is closed in a state of rest, convert it into the form of a valve.

The *Blood Supply.*—Internal maxillary, ascending pharyngeal, internal carotid.

The *Nerve Supply.*—Glosso-pharyngeal, branch of the second division of the fifth, internal pterygoid, facial (Vidian), spinal accessory.

The MASTOID PROCESS.—Situated behind the external meatus and tympanum, is under the lateral sinus.

Structure.—Dense bony shell containing air-spaces, separated from each other by thin bony plates; one big cell placed horizontally, the antrum, communicates with the tympanum —the other smaller cells are placed vertically—it is lined with a squamous mucous membrane.

The *mucous membrane* which lines the tympanic cavity is delicate and intimately connected with the bone; it covers the ossicles and forms the internal layer of the tympanic membrane. This portion is *squamous*, the remainder *ciliated.*

Blood Supply.—Stylo-mastoid.

Nerve Supply.—Tympanic plexus.

The **INTERNAL EAR** consists of a membranous labyrinth contained in an osseous one, and divided into three parts—the *Cochlea*, *Vestibule*, *Semicircular Canals.* It is situated in the petrous portion of the temporal bone, and has three openings, the *fenestræ ovalis* and *rotunda* for communication with the tympanum, and the *internal auditory canal* for the nerve. The *membranous labyrinth* contains a fluid, the *endolymph*, and is surrounded by fluid, the *perilymph.*

The COCHLEA.—Shaped something like a snail-shell, has its base towards the internal auditory meatus.

Size.—Length, quarter of an inch; base at its broadest, quarter of an inch.

Composed of:—A central column, the *modiolus*, around which winds a tapering spiral canal an inch and a half long. This canal is partially divided by the osseous spiral lamina projecting into it from the modiolus. From the osseous lamina a membrane, the basilar membrane, projects, completely dividing the passage into two—the *scala vestibuli* and the *scala tympani*, one communicating with the vestibule, the other cut off from

the tympanum, at the fenestra rotunda, by a membrane only. The two passages join at the apex by means of a small opening —the *helicotrema.*

The Scala Vestibuli is divided by the *membrane of Reissner;* this additional space, which terminates at its apex and base by blind extremities, is called the *canal of the cochlea.*

From the upper plate of the lamina spiralis the *membrane of Corti* is stretched, and between this and the basilar membrane is the *organ of Corti,* consisting of epithelial cells and rods in communication with the cochlea filaments of the auditory nerve. The *rods of Corti* stand upon the inner and outer margin of the basilar membrane, and form a canal by their heads meeting above. Ciliated rows of cells stand on the basilar membrane, and rows of air-cells on both sides of the rods of Corti.

The Vestibule.—*Shape and Size.*—Irregular shape, about one-fifth of an inch in diameter.

The *Walls.*—The Outer Wall contains the fenestra ovalis.

The Inner Wall contains a small pit pierced with holes to transmit the branches of the auditory nerve—the *fovea hemispherica,* and the small opening of the aqueductus vestibuli.

The Roof contains a depression—the *fovea hemielliptica*—opening into the semicircular canals and the scala vestibuli.

The Membranous Vestibule consists of two sacs—the *Utricle* and the *Saccule,* which occupy the fovea hemielliptica and the fovea hemispherica respectively. These sacs contain the calcareous particles, the otoliths, and the branches of the auditory nerve.

The Semicircular Canals.—Three osseous canals, with a membranous lining (attached along its convex portion), something like horseshoes in shape, with dilated ends—the *ampullæ.* Situated above and behind the vestibule, and arranged at different angles.

The Superior, the highest of the tubes, is *vertical* and *transverse.*

The Posterior, the longest of the tubes, is *vertical* and *longitudinal.* These have each one separate and one common opening.

The EXTERNAL, the shortest of the tubes, is *horizontal*, and has two separate openings.

Vascular Supply.—Branches of internal auditory artery. Veins empty into the superior petrosal sinus.

Nervous Supply.—Internal auditory.

The AUDITORY NERVE enters the ear through the internal auditory meatus, and divides into two branches—one for the cochlea and one for the vestibule.

The COCHLEAR PORTION pierces the foramina in the modiolus, and spreads out on the lamina spiralis, and terminates in connection with the cells of the organ of Corti.

The VESTIBULAR PORTION is distributed in filaments in the saccule and utricle, branches going to the ampullæ of the semicircular canals.

CHAPTER II.

PHYSIOLOGY OF THE EAR.

THE organ of hearing is made up of two distinct portions.

The *Sound-conducting.*—Composed of delicate structures, whose duty it is to convey the sound-vibrations.

The *Sound-receiving.*—A complex nervous system.

The waves of sound are conducted to the membrana tympani by the external auditory meatus, and, striking the membrane (which, unlike other stretched membranes, has no note of its own, is not thrown into vibrations by waves of any particular length more readily than by others, and answers equally well, within a considerable range, to vibrations of very different wave-lengths), set the chain of ossicles acting, producing undulations of the labyrinthine fluids and disturbance of the auditory nerves and filaments. The vibrations of the membrane are conveyed with increased intensity but diminished amplitude. The basilar membrane increases in breadth from base to apex, and the vibrations of its different parts are sup-

posed to cause the various notes—those at the base causing the high, and those at the apex the low notes.

The EUSTACHIAN TUBE balances the equilibrium of air on the two sides of the tympanic membrane (for if the tympanum be permanently closed, the vibrations of the membrane would be injuriously affected by variations of pressure from either outside or inside), and, together with the mastoid cells, allow the escape of superfluous sonorous vibrations. It also acts as a drain to the tympanic cavity.

CHAPTER III.

INSTRUMENTS REQUIRED, AND EXAMINATION OF PATIENT.

INSTRUMENTS REQUIRED:—

A. For making a direct examination.

1. A BRIGHT, STEADY LIGHT.—Sunlight, where obtainable, has no equal.

Oxy-hydrogen limelight.

Electric light.

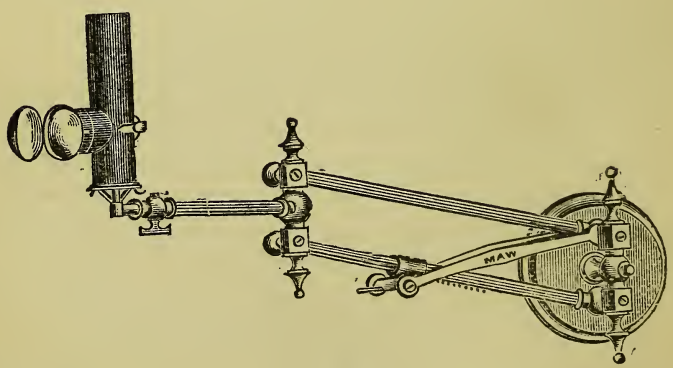


FIG. 2.

A bull's-eye and Argand burner.—Can be used either with a racked bracket (Fig. 2) or on a Queen's lamp. To avoid the

heat given off, a double chimney, with air-space between the two, the outer lined with asbestos, may be used.

Ordinary oil-lamps.

Portable oil-lamp (Maw).

Portable candle-lamp (Mayer and Meltzer).

Ordinary candle or good wax taper in cases of emergency.

2. A Frontal Reflecting Mirror.—Spectacle frame (Fig. 3).



Fig. 3.

3. Aural Specula (Various sizes).—Gruber's (Fig. 4), Toynbee's, Kramer's, or author's, for operating.

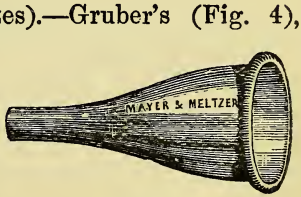


Fig. 4.

4. Pneumatic Speculum.—Siegle's (Fig. 5). A vulcanite speculum (*a*), which screws into a vulcanite box (*c*) with a glass end (*b*). An indiarubber tube with a mouthpiece (*d*) is connected with the box, to which

suction can be applied. A piece of indiarubber tubing on the speculum portion makes it fit air-tight in the meatus.

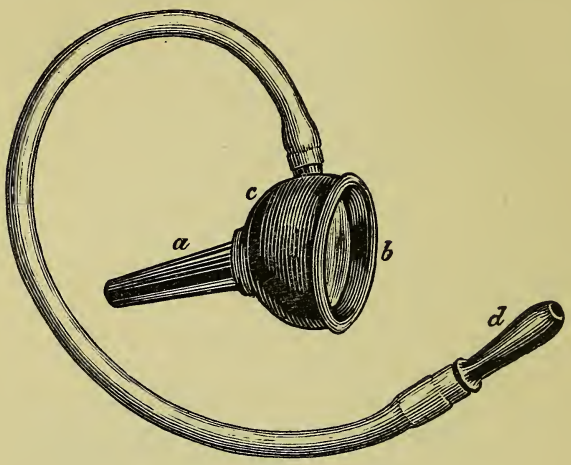


Fig. 5.

Useful for determining the presence of adhesions, and the mobility of the drum-head.



Fig. 6.

5. Nasal Speculum.—A small Thudichum (Fig. 6) or a Fränkel.

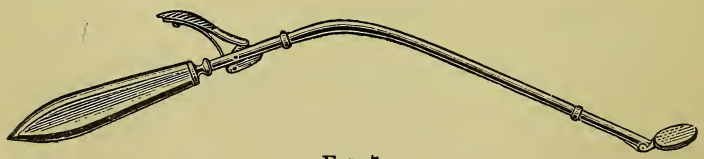


Fig. 7.

6. Posterior Rhinoscopic Mirror.—Zaufal's (Fig. 7), which

works on a hinge, or an ordinary small laryngeal mirror bent at a convenient angle.

7. Laryngeal Mirrors.—Various sizes.

8. Tongue-depressor.—Turc's. An unarmed tonsil guillotine, or the handle of the laryngeal mirror.

9. Uvula Hook, Twitch or Noose.—Not as a rule necessary. A piece of waxed silk passed through the nostrils and drawn through the mouth will pull forward the soft palate if required.

B. For ascertaining the hearing power and condition of the auditory nerve.

1. Watch.—A stop-watch, and one that strikes the quarters, very useful, especially in detecting malingering.

2. Tuning-fork.—The aural tuning-fork, large, heavy, with shifting screw-clamps to alter tones. An ordinary C fork, with wooden button on the end for placing on mastoid, etc., and pieces of drainage-tubing slipped on the prongs to alter the tones.

3. Politzer's Acoumeter—Ogston's Whistle and Galton's Pipes, etc.—Not necessary for ordinary treatment.

C. For inflating the tympanic cavity and ascertaining the condition of that cavity and the Eustachian tube.

1. Auscultation Tube or Otophone (Fig. 8).—Sometimes

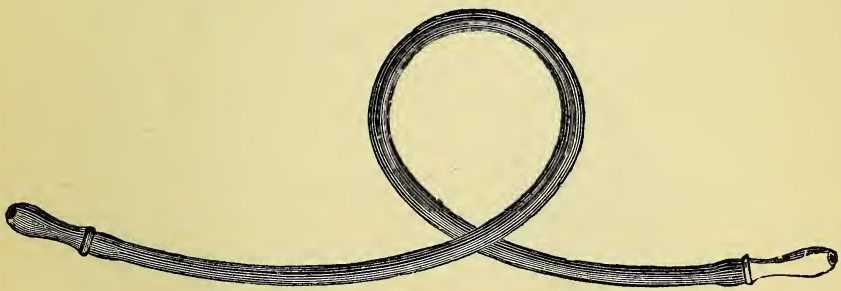


Fig. 8.

called an *otoscope*. An indiarubber tube two or three feet long, with a bone earpiece at one end for your own ear, a vulcanite at the other for the patient's.

2. Politzer's Bottle (Fig. 9).—An indiarubber bottle, hold-

ing from four to six ounces, with an inlet valve at the bottom, and a hard rubber conical nozzle (Fig. 10).

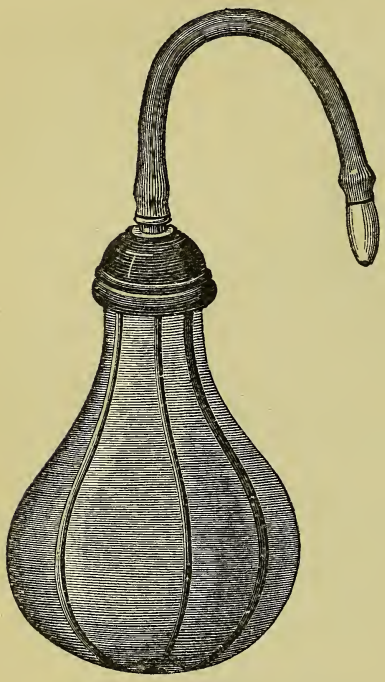


Fig. 9.

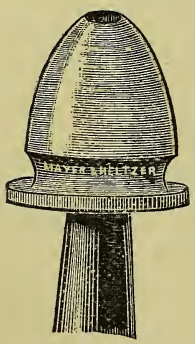


Fig. 10.

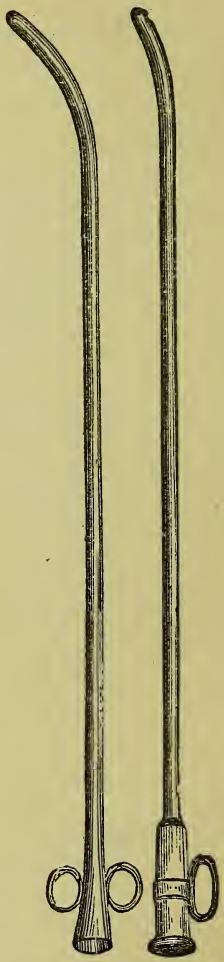


Fig. 11.

3. Eustachian Catheters (Fig. 11).—Various calibres, vul-

canite or silver; the latter are the best, and should be about four inches and a half long.

4. Hand Ball-bellows (Fig. 12).—Should have a loop to

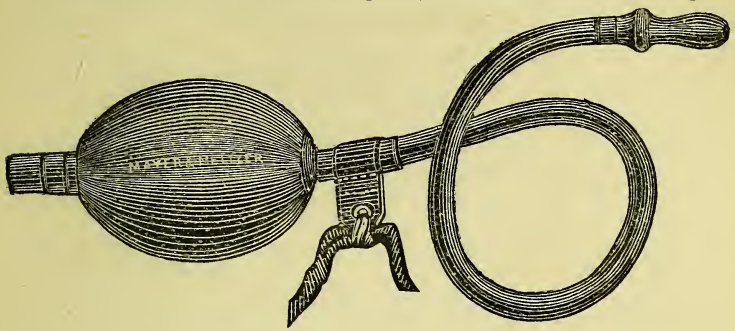


Fig. 12.

hang on a button of the coat, and a shaped nozzle to fit the end of the catheter.

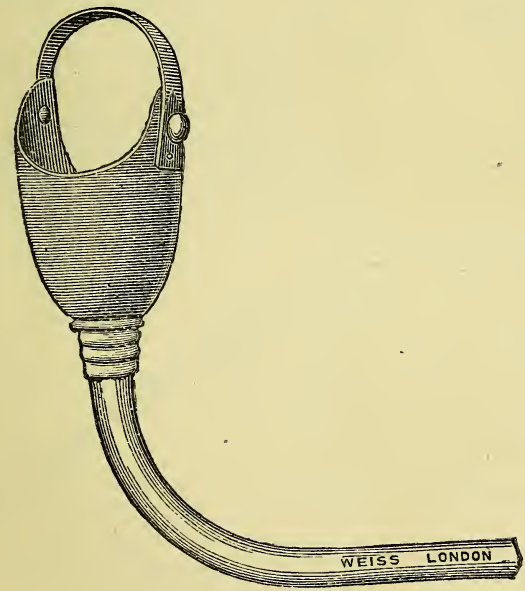


Fig. 13.

D. For clearing the external meatus and tympanic cavity and applying remedies.

1. Syringe.—Brass, holding about three ounces, with finger-rings and screw-nozzles.

2. Ear-shoot or Ear-slice.—Former author's (Fig. 13), which has a band of indiarubber to fix on the ear, is padded

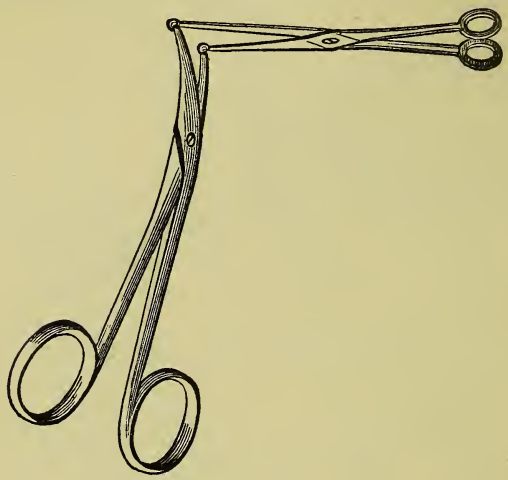


Fig. 14.

with indiarubber to prevent wetting, and has a long tube at the lower end to carry off the water.

3. Ring Forceps.—Hinton's rectangular (Fig. 14).

4. Alligator Forceps.

5. Fine Angular Forceps.

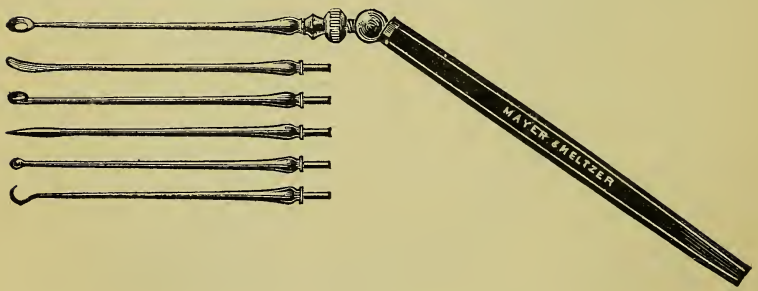


Fig. 15.

6. Small Ring-Knife set at an Angle.—A very handy set of instruments is made by Mayer and Meltzer (Fig. 15).

7. Fine Aural Probe.—Macnaughton Jones's.

8. Cotton-wool Holder.—Author's (made of ordinary wire, roughened at the end) (Fig. 16).

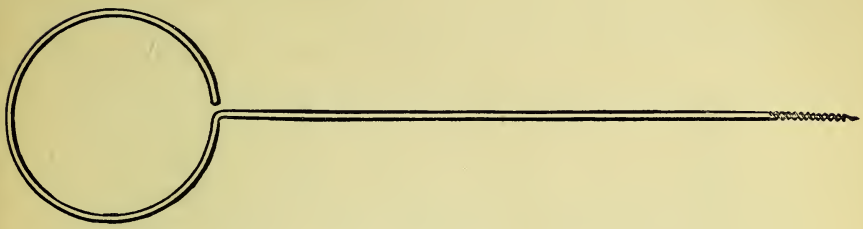


Fig. 16.

9. Chromic Acid Carrier.—Woakes's.

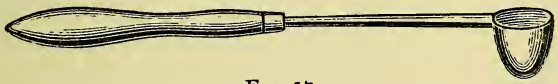


Fig. 17.

10. Platinum Crucible (Fig. 17).

11. Snares.—Various. Jarvis's small (Fig. 18) or Blake's, for ear; Woakes's for nose.

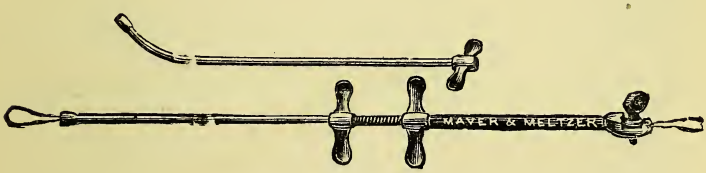


Fig. 18.

12. Myringotome.—Hinton's, Woakes's (guarded blade); an ordinary fine abscess or tenotomy knife.

13. Gottstein's Ring-Knife (Fig. 19).—For the removal of adenoid growths in the naso-pharynx.

14. Löwenberg's Forceps.—(Woakes's modification) for removal of adenoid growths.

15. Tonsil Guillotine (Fig. 20).—Spade guillotine, two or three sizes.

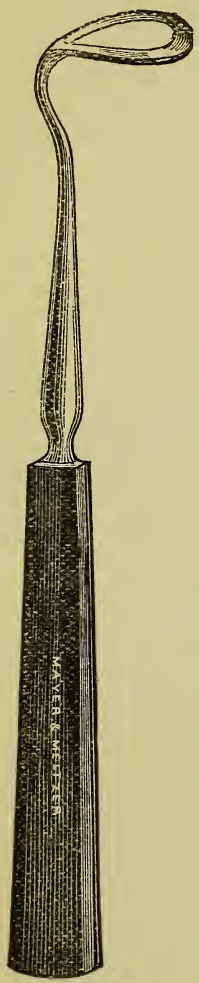


Fig. 19.

16. Insufflator.—Kabierski's or author's, made in connection with the intratympanic syringe, etc.

17. Laryngeal Brushes.

18. Nasal Sprays. — Anterior and posterior.

19. Galvano - Cautery Battery. — Schall's or Woakes's; or, if the electric wires are on to the house, a converter is best.

20. Intratympanic Syringe.—Author's douche, insufflator and aspirator.

PREVIOUS HISTORY AND PRESENT STATE.—Inquire into: Previous history and past treatment; the length of attack; mode of commencement; manner and rate of progress; general health; occupation; situation of dwelling; family history; whether the disease is unilateral or bilateral; pain, and its character; discharge, and its character; noises in the head, and their nature; giddiness; if sounds are heard at some times better than at others; what sounds, high or low, are best heard; if there is double hearing (where more than one sound is heard, although only one stimulus is given); exaggerated hearing, or error in judging the direction of a sound (Paracusis loci).

HEARING DISTANCE.—Ascertain exactly by the watch and conversation.

Watch.—Standing behind the patient, gradually approach the watch to each ear, after closing the opposite one. Repeat once or twice, and note the result in inches: C = contact, 0 =

nil. Watch not to be put close to the ear and then withdrawn, for sound lingers in fancy after it has really ceased to be heard; the auditory nerve, once stimulated, retaining the impression for a time. Change watch occasionally from one hand to the other, especially with children, to detect, if possible, malingering.*

CONVERSATION.—1. By various modulations of the voice, while ascertaining the patient's history.

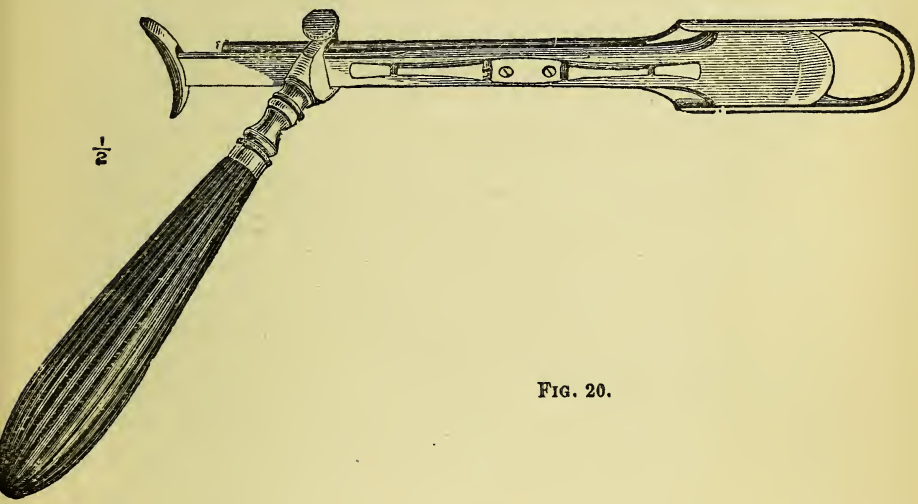


FIG. 20.

2. Standing behind the patient (to prevent lip-reading), gradually approach him, at the same time speaking in a whisper, using such soft tones as 'tip,' 'bit,' 'fish,' etc.

3. Go through the same process, speaking in your ordinary tone of voice.

4. Do the same, speaking loudly.

Each ear may be separately tested in the above manner, by first blocking the opposite meatus.

CONDITION OF AUDITORY NERVE.—Place a vibrating tuning-fork on forehead or teeth, in the middle line. In the

* Author always carries a smooth round leather pin-cushion, which can at any moment be substituted for the watch; it feels the same to the patient's ear.

normal condition it is heard with equal intensity in both ears, the test with the teeth being more acute.

If heard better in the affected ear, the sound-conducting apparatus of the external or middle ear is at fault.

If heard better in the good ear, the sound-perceiving apparatus of the internal ear is usually at fault, but this may also be due to immobility of the foot-plate of the stapes, or the secondary membrana tympani, or to a marked increase in the tension of the fluid contents of the labyrinth.

The test is liable to error in old people, on account of the change in the conducting power of the bone.

RINNE'S TEST.—Apply a vibrating tuning-fork to the surface over the mastoid process; as soon as the sound has completely died away, transfer it rapidly to the air opposite to but not touching the orifice of the meatus. If the sound is again heard, the air-conduction is better than the bone-conduction, and the hearing normal. When, on the contrary, the sound of the tuning-fork is inaudible after its transference from the mastoid process to the air, the bone-conduction is then said to predominate over the air-conduction.

WEBER'S TEST.—Consists in placing a vibrating tuning-fork upon the skull, and observing whether the sound appears more or less loud to the ear under examination when it is stopped by the finger. In the normal ear the sound is heard better when the ear is closed.

TO EXAMINE THE AURAL APPARATUS.—Before proceeding, I would here impress upon the reader the *absolute necessity* of avoiding *all force* when examining or operating on the ear: damage may be done and confidence lost. It should be borne in mind that patients may have severe attacks of coughing or fainting when the speculum is introduced.

Position.—Sit facing the patient (who should also be sitting), reflect the light (situated on the patient's left, or where most convenient) by the frontal mirror well on to the spot to be examined, getting a correct focus. Having once placed the head in the best position for making an examination, do not move it

about too much to get a more satisfactory illumination, but shift the frontal mirror.

Young children are best examined sitting on some one's lap; older children kneeling on a chair or standing. A restive child requires its arms, legs, etc., restrained by an assistant, the surgeon himself steadying the head.

EXAMINE THE FAUCES, TONSILS, PHARYNX, ETC.—These parts should be always first examined, for colour; ulceration; inflammation; any paresis; alteration in shape; old cicatrices; swelling; enlargement or alteration in the appearance of the tonsils; atrophic or granular condition of, or enlarged vessels in the pharynx; whether it has a dry, glazed appearance, and if covered with hard, dry, or moist mucus; any elongation of the uvula; the condition of the tongue.

EXAMINE THE NASAL CAVITIES (ANTERIOR AND POSTERIOR).—Anterior Rhinoscopy.—Introduce the speculum, and, using slight upward traction, throw a good light into the cavity; search thoroughly the region of the turbinate bones for any signs of swelling or polypi, inclining the head slightly backwards when examining the anterior portions, slightly forwards for the posterior. The seat of such swelling and the point of attachment of polypi should be carefully explored with a fine probe for any signs of necrosis, etc. The septum should be inspected for any deflection, outgrowth, or swelling. The nature of any discharge inquired into.

Posterior Rhinoscopy.—The patient is directed to breathe gently through the nose. The tongue is depressed with a tongue-depressor or the first finger of the left hand. The mirror is passed behind the soft palate, as close as possible to the wall of the pharynx without touching it, first on one side of the uvula and then on the other. The posterior nasal fossæ, the roof of the pharynx, the septum, turbinate bones, and the Eustachian orifices are to be carefully examined.

DIGITAL EXAMINATION.—With young children, and in any case where adenoid growths are suspected, digital examination should be employed. Stand behind the patient, and, having placed a towel over the head, pass your left arm

round the neck and place the thumb of your left hand on the front teeth of the lower jaw, covering the thumb with a corner of the towel; you can thus depress the lower jaw and prevent the patient closing his teeth on your finger. Pass the fore-finger of the right hand gently and quickly behind the soft palate, and thoroughly search the posterior nares and naso-pharynx.

A metal or leather shield is sometimes used for the finger, but it is superfluous.

ANÆSTHETIC.—In cases where, on account of irritability, it is impossible to make a proper examination, the use of a local anæsthetic, '*solution of cocaine*, 20 *per cent.*,' is required.

EXAMINE THE EAR.—The AURICLE.—Examine for any obstruction to the orifice of the external auditory meatus, arising from deformity or disease, such as eczema or erysipelas.

The EXTERNAL MEATUS.—Remember its direction. Draw the auricle with the left hand a little backwards, upwards, and outwards, to straighten it, and gently and quickly insert the speculum with the right hand. Remove any obstruction, such as wax, pus, hairs, fungi, etc., by the aid of the syringe, forceps, or cotton-wool holder. Examine for any alteration in calibre, inflammation and swelling of the soft tissues, as abscess, boils, diffuse inflammation, granulations, polypi, or eczema, or of the osseous tissues, as hyperostosis, or exostosis. Should discharge exist, and there is no perforation of the drum-head, the meatus should be thoroughly explored for caries.

Directing the patient to open the mouth will sometimes enlarge the lumen and give more room for examination.

APPEARANCE OF A NORMAL TYMPANIC MEMBRANE.—Pearly semi-transparent and highly polished. Slightly retracted at a point a little below the centre. Near the upper margin is a slight prominence, the short process of the malleus, from which, backwards and forwards to the periphery, run the two indistinct lines of the anterior and posterior folds. Extending downwards and backwards from the short process to the point of retraction, is seen the handle of the malleus. From this, passing downwards and forwards to the margin, is a triangular reflection

of light, apex upwards. When the membrane is unduly retracted, the short process and handle of the malleus and the two folds become very prominent, and the shining spot is either altered, broken up, altogether absent, or appears in some other situation. If undue bulging of the membrane occurs, all these landmarks become more or less obliterated.

The Tympanic Membrane is usually divided for description into anterior, posterior, superior and inferior segments.

Remember that it is inserted obliquely, and that the posterior and superior parts are nearer to the eye than the anterior and inferior.

Note the general appearance and any alteration of its shape; colour; injection; pulsation; opacity; transparency; mobility; flaccidity; any cretaceous deposit; old cicatrices; perforations; ruptures; polypi, or granulation tissue; appearances of the handle of the malleus; prominence of the short process, handle, and folds; alteration in the shining spot, etc. If there is an offensive discharge, examine carefully with a fine probe for any carious or necrosed bone.

To ascertain Mobility of the membrane, and the condition of the tympanic cavity and Eustachian tube—

1. By the *Pneumatic Speculum.*—This instrument has been already described at p. 19. With it, by alternately exhausting and compressing the air in the external meatus, the tympanic membrane can be made to work, its movements watched, and any adhesions discovered.

2. *By Valsalvan Process.*—The patient is directed to close the nose by holding it between the index finger and thumb, to shut the mouth, and make a forcible expiration; air will then be driven through the Eustachian tube into the tympanum. By keeping the mouth and nose still closed and swallowing, the air will be drawn back again and the tympanum emptied.

If it is desired to drive a medicated vapour into the tympanic cavity by the Valsalvan process, the patient should be directed to inhale the vapour through the mouth and nose, and then, when these are full of the steam, to go through the performance as

above. Patients should be warned not to use this method of inflation either too frequently or too forcibly, or relaxation of the drum-head or an attack of syncope may ensue.

3. *By Politzer's Method.*—The patient is directed to hold some water in the mouth. The nose-piece of a Politzer's bag is then inserted into one nostril, the other being closed by the index finger and thumb. The patient is told to swallow the water, and at the end of the second stage of swallowing, when the nasal cavity and upper part of the pharynx are closed by the soft palate and tongue, the bag is compressed, and air forced into the tympanum. This is the true Politzer's method. To take the place of swallowing the water (which may be driven by accident down the patient's throat) other means are advocated: sounding the word 'Ah' loudly and continuously (Lucae); pronouncing the words 'Hick' or 'Huck' (Gruber); or, what is by far the best in the author's opinion, directing the patient to close the lips and make a forcible expiratory effort. In young children whistling or crying will frequently answer every purpose.

Too much force must not be used, as it is possible to rupture some of the vessels in the membrane, or even the membrane itself; it may also bring on an attack of syncope, or, by driving down the soft palate, cause discomfort to the patient and non-inflation of the tympanum. It is always wise to ascertain the state of the heart before recommending either Politzer or Valsalvan, should there be the slightest evidence of disease of that organ. Another condition, pregnancy, should be inquired into. The author once had a case in the sixth month of pregnancy; after Politzerization the patient went home and miscarried. Auto-insufflation, which is, perhaps, better than Valsalvan inflation, can be employed by using Macnaughton Jones's auto-insufflator. It consists of Politzer's bag with the valve at the side instead of the bottom. To this valve is attached an indiarubber tube and mouthpiece. The nozzle is placed in the nostril as before. The patient then blows down the side tube, and at the same time compresses the bag. By attaching the tube to a Burroughs and Wellcome or any other

inhaler, and exhausting the air in the bag, it can be filled with any medicated vapour desired.

4. *By the Eustachian Catheter.*—When the tympanic cavity cannot be inflated by Politzer's method, the use of the Eustachian catheter is necessary. This is not possible in young children and in some conditions of the nasal fossæ.

HOW TO PASS THE EUSTACHIAN CATHETER.—Two or three ways are recommended. The student had better try them all, and continue to use the one he finds the most easy.

No force must be used.—The author advises the student, before using the catheter for the first time, to pass it on himself or get some one else to pass it on him; he will then understand the necessity of avoiding force.

The method the author usually employs—

1. Direct the patient to close the mouth. Depress the upper lip with the forefinger of the left hand and insert the beak of the catheter, holding the instrument parallel to the plane of the face. It is then pushed gently and swiftly forwards with the beak downwards along the floor of the inferior meatus, until the posterior wall of the pharynx is touched, at the same time raising the hand until the shaft is at a right angle with the plane of the face. Should the beak not have been kept in the inferior meatus, but have slipped up into the middle one, it will generally be found impossible to raise the catheter to a right angle. Having reached the pharynx, rotate outwards until the ring on the outer end of the instrument points to the outer canthus of the eye; the beak is then in the fossa of Rosenmüller. Press gently the outer end to the middle line, and, withdrawing a little, the beak will be felt gliding over the prominent edge of the Eustachian orifice.

2. After passing the instrument to the posterior wall of the pharynx, rotate inwards and withdraw until the septum is felt, then rotate outwards with the point downwards to the opposite side, until the ring points to the outer canthus of the eye, and it will generally be found to have entered the Eustachian tube.

3. Another method is not to turn the instrument when it has reached the posterior wall of the pharynx, but to pull it forward

until the soft palate is reached, then push slightly backwards and turn outwards.

Be careful not to tear the tubal lining, or emphysema of the cellular tissue of the pharynx or pneumothorax, with consequent lung collapse, may follow (Voltolini). If emphysema has occurred, the swelling should be at once incised ; this, if a better instrument is wanting, can easily be accomplished with the roughened finger-nail.

Vulcanite catheters can be bent to any angle to suit a particular case by slightly heating them over a lamp, but the silver ones can be sufficiently curved to suit most requirements, and are more easily kept clean.

Double curved catheters (Noyes) for passing by the opposite nostril are useful when the nasal passage corresponding to the affected ear is obstructed.

To inflate the tympanic cavity or to inject fluid into it by the Eustachian catheter.—A single hand-ball bellows should be hung on a button of the coat, the auscultation tube placed in position, and the catheter passed and held firmly in its place with the left hand; the nozzle of the bellows is then inserted, and the ball gently compressed two or three times. When fluid is injected, after ascertaining as above that the catheter is in position, the solution is taken up with a pipette, a hypodermic, or a Pravaz syringe, and dropped into the catheter; the nozzle of the bellows is then replaced, and, by pressing the hand-ball bellows, the fluid is driven into the cavity. If the operator is slightly deaf himself, it may be advisable to use a double auscultation tube, one tube fitting into each ear of the operator, or, discarding the tube altogether, judge, from the appearance of the membrane and the sensations of the patient, whether the inflation has been successfully effected.

The double tube is also useful for teaching purposes, one tube being placed in the teacher's ear, the other in the student's.

SOUNDS HEARD THROUGH THE AUSCULTATION TUBE.

1. If the passage is free and there are no adhesions, a *full clear* note is heard as the air strikes the drum-head.

2. If there is any narrowing or adhesions, a *feeble and distant thud* is heard.

3. If there is fluid in the cavity of the tympanum, there is a *moist gurgling* or *bubbling* sound.

4. In long-standing cases of retained secretion and dry catarrh of the middle ear, a *dry crackling* sound is heard.

5. If there is a perforation, a *whistling* sound is heard close in the operator's ear.

CHAPTER IV.

DISEASES AND INJURIES OF THE EXTERNAL EAR.

Divided into—

1. Diseases and injuries of the auricle.
2. Diseases and injuries of the external auditory meatus.

1. DISEASES AND INJURIES OF THE AURICLE.—MALFORMATIONS.—Unilateral or bilateral.—Occlusion of the meatus from a doubling up of the auricle.

Deficient or excessive growth.

Entire absence.

Increase in number. Children are born at times with two or more auricles on either side in abnormal situations.

Arrested development, leaving a branchial fissure.

Treatment.—Surgical interference when possible, according to requirement.

Anæsthetic.—Gas and ether.

DERMOID CYSTS occur usually in the line of the first pre-oral cleft, caused by the nipping in of a fold of dermoid tissue.

Treatment.—Removal.

Anæsthetic.—Gas and ether.

WARTS sometimes grow on the auricle.

Treatment.—The daily application of *salicylate collodion.* Ligature with application of *acid nitrate of mercury* to the base.

CHALK STONES are generally found in the upper portion of the helix.

Treatment.—Non-interference unless they produce inconvenience, when removal may be necessary.

Cysts.—Small cysts sometimes form in the lobule, and are liable to become inflamed.

Treatment.—Removal of the cyst-wall.

Othæmatoma.—An effusion of blood between the cartilage and perichondrium.

Divided into traumatic and idiopathic.

Traumatic.—The result of direct violence, such as a blow.

Idiopathic.—Occurs more frequently in the insane.

Symptoms.—Rapid growth with little or no pain; tense, shining reddish-blue colour, varying in size, situated on the anterior surface of the auricle, sometimes confined to one spot, at others occupying the whole auricle with the exception of the lobule, which is never involved; contains blood which solidifies and then shrinks; new fibrous tissue is thrown out, causing at times great deformity; suppuration may occur, followed by rupture of the sac.

Prognosis.—Bad.

Treatment.—Evaporating lotions; vesication; puncture of tumour and aspiration; evacuating contents and applying pressure; ice; iodine; lead lotion; methodical massage.

Malignant Diseases.—Epithelioma, sarcoma.

Treatment.—Amputation, *partial*, in the early stages; *complete*, in the late stages.

Fibrous Tumour.—Semi-malignant, varying in size from a pea to a hen's egg, produced by wearing ear-rings.

Treatment.—Excision.

Keloid Growths.—Semi-malignant, produced by wearing ear-rings.

Treatment.—Excision.

Anæsthetic.—For all these cases, gas and ether.

Perichondritis.—*Causes.*—Degenerative changes of the cartilaginous framework; blow; burn; frost-bite, etc.

Symptoms.—Red, sometimes almost black, tense swelling, containing a yellowish-pink fluid or dark blood; more or less thickening of the parts; ulceration.

Prognosis.—In simple cases, favourable. Where there is much ulceration, the deformity may be considerable.

Treatment.—Incision and evacuation of the fluid; pressure. The ulceration should be touched with the solid nitrate of silver. Cod-liver oil, tonics, and a good generous diet.

Angeiomata sometimes occur; they present the same features as in other parts of the body.

Treatment.—Galvano-cautery in *one* sitting, if *small;* if large in size, a small portion is best done at a time. Hæmorrhage may occur, and it may be necessary to tie the carotid or the vessels supplying the tumours.

Injuries, such as tears, cuts, etc., heal readily when carefully cleaned and adapted, plenty of sutures being used.

Skin Diseases.—*Eczema*, acute or chronic, is of the same nature as that found in other parts of the body. It occurs behind the ear in the cleft between the auricle of the mastoid in fat children, and in the anæmic, strumous, and debilitated. In the skin around the meatus it may be due to an acrid discharge from that canal, or to lack of cleanliness and improper diet.

It occurs in strumous children in connection with the exanthemata.

The constitutional causes, such as gout, rheumatism, etc., are the same as in other regions.

Symptoms vary from simple redness and slight infiltration of the skin to a continuous mass of scabs and ulceration, with more or less irritation. This ulceration at times will destroy extensively parts of helix or lobule.

Prognosis.—Favourable.

Treatment.—Remove all exciting causes by perfect cleanliness; abstinence from all alcoholic liquors; attention to diet, fresh air, open bowels; give arsenic, colchicum, iron, iodide of potassium, and cod-liver oil, as required. Soak the scabs and crusts away with weak carbolized oil. Use bran water for washing the parts, and apply one of the following ointments:—

Plumbi acet., hydrarg. subchlor., āā grs. x.; lanoline, ʒ j.
Ung. plumbi.

Ung. acid boric.
„ hydrarg. nitratis dil.
„ iodoformi.

Or a lotion of—

Pulv. calamin, grs. xxv.; pulv. zinc oxidi grs. xv.; glycerine pur, ʒ ss.; liq. carbonis detergens, ♏ v.; aquam ad ℥ j.

Liq. plumbi subacet., ʒ j., to two tablespoonfuls of new milk.

The lotions or ointments sometimes require frequent changing. Cimolite powder used after the lotions is very soothing. All ulcerated points should be touched with solid nitrate of silver.

Erysipelas.—Swelling, redness, burning sensation, same appearance as in other parts of the body.

When chronic, it is frequently associated with cardiac mischief. Care must be taken to diagnose between this disease and mastoid inflammation.

Treatment.—Perchloride of iron, port wine. Warm carbolic lotions should be gently syringed in the ear, a mild mercurial or boric acid ointment used, or the surface painted with flexible collodion.

Erythema.—Swelling and redness as in other parts.

Treatment.—Lotion of sodæ bicarb., grs. x.; glycerine pur, ♏ v.; elder flower water ad ℥ j. An aperient.

Frost-bite.—Symptoms.—In slight cases, the auricle has a red-purplish and somewhat swollen appearance. In actual freezing, a whitish look, and after prolonged exposure to freezing it becomes quite brittle.

Prognosis.—In favourable cases, the auricle gradually assumes its natural colour, but may leave some permanent redness behind.

In bad cases, the inflammation that sets in may be followed by gangrene.

Treatment.—In simple cases, rubbing gently with snow and a spirit lotion will be all that is necessary.

In severe cases, amputation of the gangrenous portions may be necessary.

The best method of thawing a frozen ear: Rub gently with snow first, then *cold* water, and when circulation is established, use tepid water. This is to be done in a *cold* room.

Herpes.—Herps Zoster.—Same as elsewhere.

Treatment.—Some simple ointment; quinine internally.

Icthyosis.—Generally congenital.

Symptoms.—Dry crusts on a hard scaly black skin.

Treatment.—Relief may be obtained by application of glycerine and bran baths; alternative, amputation.

Lupus.—Symptoms.—Rough reddish patches, with nodules which may or may not soon break down.

Treatment.—Careful and repeated cauterization or scraping with a sharp spoon. Resorcin ointment, or a saturated solution of papain in glycerine, may be tried. Iron, quinine, arsenic, and cod-liver oil internally.

Pruritus.—Usually occurs in elderly people and persons suffering from defective circulation.

Treatment.—Menthol and other soothing lotions or ointments; arsenic internally.

Syphilis.—Symptoms.—Secondary eruptions, papular or squamous; sloughing of auricles; condylomata round the orifice of the meatus; gummata.

Primary chancres have been known to occur.

Treatment.—Iodide of potassium, mercury, and other anti-syphilitic treatment; black wash or bichloride lotion. Ung. hydrarg. to condylomata, or dusting with calomel.

Raynaud's Disease.—Ulceration and gangrene of the auricle, with consequent loss of substance in the upper portions, may occur in this disease.

2. DISEASES AND INJURIES OF THE ETERNAL AUDITORY MEATUS. — Congenital Absence of. — Unilateral; usually accompanied by malformation of the auricle.

In one case of the author's, a child of six months, there was complete absence of both auricle and meatus on the right side; left, normal.

Treatment.—Surgical interference may be tried, usually most unsatisfactory, and, if the other ear is normal, should not

be attempted; for even if the auditory nerve, as tried by the tuning-fork, is all right, the middle ear may also be imperfect.

Cerumen may be deficient or in excess, soft and oily or dry and crumbling, often mixed with hair, epidermic scales, and fungi. An eczematous condition may also be present.

Absence of.—This occurs frequently in persons suffering from a catarrhal inflammation of the middle ear, in gouty and rheumatic constitutions. It is more common in old people.

May be due to a morbid condition of the trophic nerves (Politzer).

Treatment.—Glycerine, lanoline, or alkaline lotions.

A solution of menthol in parolein or adepsin oil sprayed into the meatus, with Burroughs and Wellcome ointment spray, is extremely useful.

Excess of, with impaction.—Due to a deficiency of moisture in the wax; a narrow orifice; imperfect cleanliness, especially after the free use of soap; taking cold from sitting in draughts, etc.; use of towel-ends and ear-picks. Cotton wool sometimes forms the nucleus of the mass, it having been inserted at some previous time and forgotten.

Symptoms.—Deafness on the affected side, sudden or gradual, partial or complete; sometimes tinnitus, usually of a singing or rushing character; numbness; giddiness; and pain.

A dark-looking, frequently shining, mass in the meatus.

After removal, often a great deal of redness and inflammation of the skin of the meatus and retraction of the drum-head.

Prognosis.—Generally good, but wax long impacted may cause a perforation of the drum-head; a thickened condition of the epithelial layer, or undue pressure through the chain of ossicles upon the labyrinthine contents.

Treatment.—Careful syringing with *warm* water to which a small quantity of bicarbonate of soda may be added. The syringe should be used very gently, the stream of water being directed along the roof, with an occasional jet along the floor.

Not into the centre of the mass, or it will be driven further in. If the plug is obstinate, a few drops of a warm solution of bicar-

bonate of soda (grs. xv. ad ʒ j.), or a warm weak solution of liq. potassæ, placed in the meatus for a few nights, will soften the wax and greatly assist the syringe in doing its work. Do not instil oils and oily substances, for they rapidly become rancid, and form a nest for innumerable spores of fungi. The plug occasionally swells when fluid is instilled, causing some discomfort.

When syringing, let the first jet strike the concha, to avoid shock. *Never use force.* Do not syringe an exposed drum-head. Be extremely careful if the drum-head is perforated or wounded in any way. Do not syringe too long at a time, and examine with the speculum from time to time. Remember that attacks of giddiness frequently, and syncope occasionally, occur. With children, extra care should be taken. And *mind the water is warm.*

All instrumental interference by those not skilled in the use of aural instruments should be most strictly avoided. To those who are accustomed to use them, a small scoop, the aural probe, and fine angular forceps, will materially assist the removal of an obstinate plug. If from the previous history you are led to suspect a perforation of the drum-head, a sharp application of Politzer's bag will sometimes assist to dislodge the mass. After removal, it is as well to Politzerize the ear a few times.

Impaction of Epithelial Scales usually occurs in old people, and is frequently mixed with cerumen and hairs.

Symptoms and *Treatment* are the same as in the case of a plug of cerumen. After removal, the walls are generally red and scaly.

Foreign Bodies frequently lodge in the meatus.

Symptoms.—Pain; swelling; hæmorrhage; deafness; tinnitus; discharge; occasional epileptiform seizures; vomiting and coughing. All these symptoms may occur; on the other hand, the substance may stop in the ear for a long time without causing any inconvenience or damage. There is usually a history of a foreign body having entered the ear.

Prognosis.—Guarded. Depends on the nature of the foreign

body; length of time in the ear; what previous attempts have been made to remove it.

When first introduced they are generally lodged at the junction of the cartilaginous and osseous portions of the meatus, and are then easily got rid of; but clumsy and unskilled attempts at removal frequently result in the substance being driven further on to the drum-head, which is thus often injured, and fatal consequences have ensued.

Treatment.—If the substance has been in the meatus for some time, remove all swelling and inflammation. This is as a rule readily effected, and the acute pain relieved by leeching in front of the tragus—at least two, repeated, if necessary; or the use of a lotion of acetate of lead, gr. j., to the ounce of warm water. This should be poured into the meatus whilst the patient is lying down, and allowed to soak for ten minutes at a time. After the meatus has been thoroughly fomented with water as hot as can be borne, make a careful examination with the speculum, to be sure there is a foreign body to remove, and remember to examine both ears, for patients occasionally refer to the wrong one. Then carefully syringe the ear, if necessary placing the patient on the affected side, and syringing from below, an anæsthetic (gas and ether preferred) being given if required. A sharp tap on the opposite side of the head, while the patient is lying as above, will sometimes dislodge the substance.

Do not use any other method until this has been tried over and over again.—In the case of a dried bean or pea, or piece of sponge, if not quickly removed, instruments had better be used, as the water will cause the substance to swell if not at first dislodged. A fine galvano-cautery point is very useful in breaking it up.

The following methods for removal have been suggested and tried:—

The Agglutinative.—Attach a piece of calico or coarse substance to the foreign body with glue, cobbler's wax, or dentist's cement, and then remove with forceps.

A bent probe, scoop, or a fine wire noose may be passed

behind the obstruction, or it may be removed by aural forceps, the alligator forceps being most useful.

Turning the auricle forward and cutting through the posterior wall of the meatus has been recommended, when the foreign body cannot be removed by the natural channel.

It is better not to employ cocaine where the operator is not accustomed to aural instruments, the pain caused being an indication not to go too far.

Anæsthetic.—In children and hysterical people who will not keep quiet, it is necessary to employ an anæsthetic. Gas with a whiff of ether is sufficient.

Foreign bodies, such as pins, etc., have been forced into the tympanum and passed into the Eustachian tube. Repeated efforts at swallowing may sometimes dislodge them.

Insects sometimes get into the external auditory meatus, small fish have been known to enter during bathing, and maggots from the larvæ of flies are sometimes found.

Symptoms.—Irritation; deafness; tinnitus, giddiness; faintness; nausea may be present. When maggots are present, little white moving bodies are seen.

Treatment.—Syringing with warm water, after warm weak carbolized oil has been poured into the ear and allowed to soak. The vapour of chloroform will kill the maggots from the larvæ of flies; they can then either be syringed out or removed with fine rectangular forceps.

Vegetable Fungi.—The *Aspergillus nigricans* is the most common.

Cause.—Some chronic unhealthy affections of the meatus; dried-up discharge; oily matters which have been placed in the ear, and which quickly become decomposed when exposed to the atmosphere at the high natural temperature of the meatus; the use of lotions that have been kept for some time; damp dwellings; damp beds, etc.

Symptoms.—Sensation of fulness in the ear; deafness; tinnitus; dull heavy pain; irritation; giddiness, with sometimes a slight serous discharge. The meatus is generally blocked, with a thin greyish-white substance like wet newspaper

sprinkled with coal-dust, and mixed or not with epithelial *débris*. When the plug has been removed, a thin greyish-white coating clings to the drum-head and sides of the meatus, which, when displaced, leaves a red inflamed surface. It is reproduced in a few hours. It is therefore necessary to see the patient off and on to ensure a cure. Where the drum-head is perforated, it may be found in the cavity of the tympanum.

Treatment.—Absolute cleanliness. Syringe with warm water, dry thoroughly with absorbent wool, and use as a lotion: a saturated solution of boric acid in alcohol; equal parts of alcohol and glycerine; solution of bichloride of mercury, 1 in 1000; hyposulphite of soda, grs. iij. ad ʒ j., or chloride of lime, grs. ij. ad ʒ j. Where the drum-head has been perforated and the cavity of the tympanum invaded, it must be thoroughly washed out with the intra-tympanic douche.

Boils and Abscesses (*Circumscribed Inflammation*).—The causes, symptoms, treatment, etc., of these are so much alike that they may be considered together.

Causes.—Colds from draughts; ear-picking; foreign bodies; collection of cerumen and irritating discharges; constitutional debility; malaria. Patients suffering from boils in the external auditory meatus seldom get them elsewhere.

Symptoms.—Ear feels full and heavy, some deafness and tinnitus; great pain, increased at night, and by movements of the jaw and auricle; it radiates over the side of the head, and the whole external ear may become swollen and excessively tender; slight fever and constitutional disturbance. A circumscribed swelling, situated in any portion of the meatus, and varying in size from a small pea to a swelling that may block the entire canal, is seen. There may be a slight discharge.

Prognosis.—Favourable, though recurrence is very liable in different sites in the meatus.

Treatment.—Early and free incision down to the periosteum. Find out the most tender spot with a probe, and incise it deeply, cutting from within outwards. The meatus to be washed out regularly with a weak boric acid lotion after incision. Leeches in front of the tragus, from two to four, repeated, if necessary,

and counter-irritation over the mastoid; hot poppy fomentations. A concentrated alcoholic solution of boric acid. Medicated gelatine and opium ovoïds, or a few drops of warmed laudanum. A 20 per cent. solution of menthol in adepsin oil or paroline, applied on cotton wool, and allowed to remain for twenty-four hours if there is no suppuration, is useful. Two to four drops of a 5 per cent. solution of carbolic acid injected into a boil has been recommended. Poultices should not as a rule be used, but a small conical-shaped linseed poultice introduced into the meatus does good sometimes.

Give iron and quinine, cod-liver oil, arsenic, or sulphide of calcium. The bowels should be kept open with salines; regular habits and avoidance of late hours enforced.

In applying leeches, be careful always to stop the meatus with cotton wool, to prevent either blood or the leeches themselves from entering.

Anæsthetic.—Cocaine 20 per cent., when incision is required.

Acute Diffused Inflammation of the Meatus.—*Causes.*—Colds from draughts; ear-picking; sea-bathing; foreign bodies, and unskilled attempts to extract them; impacted cerumen; vegetable fungi; the exanthemata; constitutional causes, such as gout, syphilis, etc.; direct violence.

Symptoms.—Deafness; throbbing tinnitus; pain, increased by movements of the jaw and auricle; itching sensation, frequently most intense and irritating; fever; swelling to occlusion of the meatus; redness; extreme tenderness; some slight sero-sanguineous discharge, not infrequently caused by the improper use of poultices; and perforation of the drum-head may take place.

Should the inflammation be of a prolonged and intense nature, granulations and polypi may be present. In delicate, ill-nourished children, extensive gangrenous sloughs may be formed, which may encroach upon the adjacent soft structures of the cheek, head, and neck, causing their destruction. Diphtheritic membranes may form.

Prognosis.—Guarded, owing to possible implication of the middle ear, the mastoid process, and perhaps the cranial con-

tents. Diphtheritic and gangrenous conditions are rare and extremely fatal.

Treatment.—Hot poppy fomentations, antiseptic warm douches, a warm solution of cocaine 10 per cent., warm lead-and-opium lotions, leeches in front of tragus, mastoid counter-irritation; Lieter's irrigator. If the pain continues, search for a tender spot with a probe, and then cut down to the periosteum. If suppuration has become established, astringent washes should be used two or three times a day, then carefully dry and blow in finely powdered boric acid. Give salines, pay attention to diet, and strict abstention from alcoholic liquors must be enforced.

Chronic Diffuse Inflammation usually follows an acute attack.

Symptoms.—Deafness from narrowing of the passage, and collection of pus and epidermic scales; slight discharge; ulceration. Tympanic membrane is reddened, thickened, occasionally perforated, and granulations appear.

Treatment.—Mild astringent lotions, such as: Sol. of boric acid, grs. x. ad ʒ j.; zinci sulph. and acid. carbolic, āā grs. v. ad ʒ j. Finely powdered boric acid. Solid nitrate of silver should be applied to the ulcerations. Granulations should be touched with solid nitrate of silver or chromic acid. For general treatment: tonics; cod-liver oil; fresh air; regular habits.

Eczema.—Usually of a dry desquamative character, but may be moist.

Causes.—Constitutional, such as gout, indigestion, etc., or an irritating discharge in debilitated anæmic children or old people.

Symptoms.—Deafness and tinnitus caused by a swollen condition of the sides of the meatus, and the filling up of the lumen with epithelial *débris;* slight muco-purulent discharge. In old people, the meatus is generally dry, causing a considerable amount of itching and irritation.

Prognosis.—Decidedly unfavourable in the dry variety of old gouty people.

In children, favourable.

Treatment.—Soak the scales and scabs well with carbolized oil or glycerine until most are removed, and then treat in the same way as in eczema of the auricle, observing perfect cleanliness. Attend to diet, and treat the constitutional cause from which it arises with arsenic, cod-liver oil, colchicum, iodide of potassium, etc., as required.

Erysipelas.—*Symptoms.*—Swelling; redness; narrowing of the passage, and consequent deafness.

Prognosis.—Guarded, but generally favourable.

Treatment.—No special treatment beyond that usual in erysipelas.

Complete Closure of Meatus may occur from inflammation, either by a membranous septum or by dense bone.

A polypus may adhere to a raw spot on the opposite surface of the meatus, causing occlusion.

Treatment.—Removal of the membranous septum, and applying chromic acid to the cut surface. For treatment of the osseous obstruction, see 'Exostosis.' *

Anæsthetic.—Cocaine 50 per cent. locally.

Otorrhagia.—Hæmorrhage from the external meatus is a common symptom of various diseases and injuries, such as fracture of the base of the skull, rupture of the drum-head, smallpox, yellow fever, suppressed menses, polypi, etc.

Treatment.—Treat the cause.

Ear Cough.—Patient has a fit of coughing, more or less violent, on the introduction of a speculum or foreign body into the meatus, due to irritation of a twig of the auriculo-temporal branch of the fifth cranial nerve, and so the floor of the fourth ventricle.

Treatment.—If bad enough to prevent the insertion of the speculum, try cocaine.

Sebaceous Tumours.—Produce absorption of the bone without pain, cause great dilatation, and may set up brain mischief.

Symptoms.—Deafness from blocking the meatus.

* See p. 49.

Treatment.—Removal, being careful to take away the whole of the sac.

Anæsthetic.—Gas and ether.

Polypi and Granulation Tissue may spring from the walls of the meatus. Their symptoms and treatment will be more fully described in the paragraphs on Aural Polypi.*

Syphilis.—*Symptoms.*—Ulceration and condylomata. Gummata are rare.

Treatment.—Cauterization, mercury, and iodide of potassium; black wash as a lotion.

Malignant Disease.—Epithelioma has been known to appear primarily in the external meatus, but is usually secondary, due to extension from neighbouring parts, the cavity of the tympanum, etc. It may appear first as an eczema, soon proceeding to destructive ulceration, or as a small painful nodule.

Treatment.—Where possible, removal. The use of a sharp spoon and caustics may do some good.

Anæsthetic.—Gas and ether.

OSSEOUS TUMOURS.—Hyperostosis. — An inflammatory thickening of the osseous walls of the meatus.

Causes.—The spread of inflammation from adjoining parts; the irritation of an acrid discharge; polypus, or caries of adjacent bone; syphilis; gout, etc.

Symptoms.—Narrowing of the meatus, causing deafness and tinnitus; and penning up of secretions in the auditory canal or tympanum.

Prognosis.—Guarded.

Treatment.—Find out cause, and remove all sources of irritation; cleanliness. After inflammation has subsided, if the thickening remains, the introduction of small ivory bougies or laminaria tents, painting the surface with tincture of iodine or nitrate of silver. If these do not relieve the symptoms, the mallet and chisel or the dental drill must be employed. The greatest care and caution must be taken in using these instruments, and *they should not be used at all unless absolutely necessary.*

* See p. 67.

Anæsthetic.—Gas and ether.

Exostosis.—Differs little from exostoses in other parts of the body. They may be divided into spongy, ivory, and an intermediate variety. Are usually found arising at the junction of the cartilaginous and osseous portion of the canal.

Causes.—Gout; rheumatism; sea-bathing; or the irritation of a constant discharge of pus.

Symptoms.—Deafness from blocking the meatus; tinnitus.

The Spongy.—Pedunculated; single, rapidly growing, usually arising from the middle ear as the result of suppurative inflammation; sometimes preceded by a polypus.

Treatment.—Removal by snare.

Anæsthetic.—Cocaine 20 per cent. locally.

The Ivory.—Resembles ivory in consistence, is more common in men than women. A tumour with a broad base arising from the posterior wall, and usually close to the orifice of the meatus; of slow growth and covered with a smooth white skin; may be single or multiple.*

Treatment.—Counter-irritation; electricity; sea-tangle and sponge tents have all been tried. The most effectual treatment is drilling with the American dental drill. A steel guard may be placed behind the tumour, when situated near to the tympanum, and the operation conducted with great care and caution, two assistants being necessary—one to work the drill, and the other to take care of the guard (if used). The mallet and chisel are sometimes preferred. If employed, take a firm rest on the side of the head with the chisel hand, to prevent slipping too far in. The auricle may be turned forward and the tumour attacked in this way. Dilute nitric acid injected into the tumour when partially penetrated will sometimes act as an absorbent (Pritchard).

Anæsthetic.—Gas and ether.

Intermediate.—Partakes of some of the characters of both the ivory and spongy varieties; is generally multiple, and has a broadish base.

* Karewski relates the case of a girl, æt. 13, with multiple exostosis of the face and four in the left auditory meatus.

Treatment.—Removal by the snare, chisel, or drill; Bonnafont's dilators; sea-tangle or sponge tents; painting with tincture of iodine.

Anæsthetic.—Cocaine 20 per cent. locally. Gas and ether if the drill or chisel is used.

Caries.—Seldom found uncomplicated.

Causes.—Direct violence, such as a blow. Intense inflammation.

Symptoms.—Pain; offensive discharge; dead bone easily felt with probe.

Prognosis.—Favourable, when seen in the early stages; bad, when there is much extension.

Treatment.—Removal by sharp spoon or forceps; absorption by a sulphurous acid lotion (1 in 8).

Injuries.—Fractures through the osseous portion, generally complicated by fissure of the upper and inner tympanic walls, the mastoid process, or the petrous portion of the temporal bone.

In fracture of the lower jaw a portion may be driven through the meatus.

A Cerebral Abscess may find an opening and discharge through the meatus.

In Suppurating Parotitis, the pus may find its way through the fissures of Santorini in the cartilaginous portion of the meatus.

CHAPTER V.

DISEASES AND INJURIES OF THE MIDDLE EAR.

COLLAPSE AND OBSTRUCTION OF THE EUSTACHIAN TUBE.—*Causes.*—Catching cold; draughts; damp; sea-bathing; rheumatism; phthisis; exanthemata; scrofula; diphtheritic paralysis; any weakening disease; general debility; mental shocks; unhealthy conditions of life; thickening and relaxation of the faucial mucous membrane; hypertrophied faucial and pharyngeal tonsils; adenoid growths; rhinitis, and

all kinds of nasal obstruction; closure by membranous adhesions, mucus, or cicatrices; thickening of the osseous walls of the tube; paresis of the tubal muscles.

Symptoms.—Stuffy feeling in the ear during a cold; deafness; tinnitus and earache at times; swollen faucial mucous membrane; granular pharyngitis; swollen condition of the pharyngeal orifice of the Eustachian tube; enlarged tonsils; rhinitis.

The drum-head in the early stages is retracted without loss of colour. In the later stages it becomes dull, white, opaque, and retracted; the short process, anterior and posterior folds, very prominent; the handle of the malleus more or less foreshortened. The shining spot is altered in appearance or situation, or entirely disappears. There is no response, or a very slight one, on inflation by Politzer's.

Prognosis.—Guarded; for usually the patient has allowed a long time to elapse before seeking advice, and unless seen early it soon becomes chronic, producing troublesome deafness and tinnitus, and may lead to suppurative inflammation of the tympanic cavity, with perforation of the tympanic membrane. The accumulated mucus hardens in the tympanum, causing adhesions and ankylosis of the ossicles.

Treatment.—Inflations by Politzer, Valsalvan,* or through the catheter, frequently at first, then gradually getting less; Valsalvan inhalations of iodine and ether (tinct. iodi, æther acet., equal parts, a teaspoonful in a pint of water at 140° F.); or of guaiacum (tinct. guaiaci ammoni, sp. camph., equal parts, a teaspoonful in a pint of water at 140° F.); an alkaline nose-wash—bicarbonate of soda and borax, each grs. v.; acid carbolic pur, gr. ss.; aquam ad ℥ j.†; or a solution of common salt. Wash out the tympanum through the Eustachian catheter with a solution of iodide of potassium (grs. v. ad ℥ j.), or an alkaline wash (soda bicarb., grs. x. ad ℥ j.); astringent appli-

* The Valsalvan process should not be resorted to except under frequent medical supervision, or undue relaxation may result.

† Burrough and Wellcome's nasal tabloids are very useful. They are easily carried about and easily dissolved.

cation to the fauces, such as zinci chloridi, grs. xxx. ad ʒ j., etc.; galvanism to tubal muscles through the Eustachian catheter. General bracing of the system; change of air. Tonics: a mixture of iodide of potassium, grs. iij.—grs. v., and tincture of nux vomica, ♏ x.—♏ xv. ad ʒ j. Obstruction from a chronic catarrh may sometimes be relieved by passing a Eustachian bougie.

INFLAMMATION OF THE MIDDLE EAR: MYRINGITIS.—The tympanic membrane may be attacked with inflammation of its dermoid layer, without the cavity being implicated.

Cause.—Cold from draughts, etc.; or direct violence.

Symptoms.—Deafness; fulness; and throbbing tinnitus; deep-seated pain, especially on moving the jaw; pressure on the tragus and on insertion of the speculum; hæmorrhage and perforation may occur; the drum-head, slightly injected at first, goes on to general redness; some bulging; vesicles sometimes form on the surface.

Prognosis.—Generally favourable.

Treatment.—Hot poppy fomentations; leeching in front of the tragus; counter-irritation over the mastoid (mustard leaf, iodine paint, or liq. epispasticus). Eustachian tubes kept patent with Politzer. Valsalvan inhalation of guaiacum (this and the Politzerization, if used with *gentleness*, causes no inconvenience). Warm alkaline nose-wash. Throat and naso-pharynx, if affected, painted with a solution of chloride of zinc, grs. xxx. ad ʒ j.

Finely powdered boric acid to be blown into the meatus; warm drops of acetate of lead, grs. ij., and tincture of opium, ♏ x.—xv., to water ʒ j., or sol. cocaine 20 per cent. Bromides or hydrobromic acid to relieve the tinnitus. Quinine, etc.

If there should be much bulging of the drum-head, paracentesis or scarification should be resorted to.

PARACENTESIS OF THE TYMPANIC MEMBRANE.—Patient in a sitting position, head well supported and held firm by an assistant, and a good light thrown on the membrane.

Use a spear-headed, double-edged myringotome as small as convenient, a Woakes guarded, an abscess or tenotomy knife,

or a small sharp-pointed bistoury; cut into the posterior and inferior quadrant or the seat of greatest bulging; be careful not to go too deep. Avoid all damage to the ossicles, more especially the incus, its attachments being very slight, and the chorda tympani nerve.

Gentle Politzerization after incision; sometimes useful to aspirate the tympanic cavity, and then thoroughly wash out by means of the intra-tympanic syringe. It is sometimes necessary to cut a piece out of the drum-head to ensure the patency of the opening.

Anæsthetic.—Only necessary in children and hysterical persons; gas usually sufficient.

CRETACEOUS DEPOSITS IN THE TYMPANIC MEMBRANE.—Usually composed of phosphate of lime.

Causes.—Long-standing inflammatory diseases, especially in gouty subjects.

Symptoms.—Deafness may be slight or very great; severe tinnitus and vertigo may be present. The membrane has white chalky patches upon it, arranged crescentically near the periphery, or irregularly radiating towards the handle of the malleus; they are usually unilateral.

Prognosis.—Hearing may improve, and the tinnitus cease after an operation.

Treatment.—Non-interference unless the tinnitus becomes great, then either incision of the membrane or excision of the diseased portion.

Anæsthetic.—Cocaine 20 per cent. locally.

ACUTE INFLAMMATION OF THE MIDDLE EAR.—Bilateral at times; more often the inflammation is greater on one side than on the other; occurs most frequently in children.

Causes.—Cold; draughts; wet feet, etc.; the exanthemata, more especially scarlet fever and measles; puerperal and recurrent fevers; typhus; typhoid; diphtheria; pneumonia; Bright's disease; sea-bathing, particularly in the surf, when minute irritating particles of sand and *débris* penetrate the nasal passages and lodge in the tympanic cavity; the passage of blood in epistaxis where the nares have been plugged (Gellé);

other fluids; a foreign body passed by the tubes; blows on side of head; direct injury to the drum-head; the too-free application of the galvano-cautery to the nasal cavities or fauces; mumps; tonsillitis; syphilis; all acute catarrhal conditions of the naso-pharynx; the inhalation of sewer-gas, and other malarial conditions; the otitis intermittens of Weber Liel; epidemic influenza; habits such as drinking, smoking, or snuff-taking, to excess; occupations such as brass-workers, chemical manufacturers, and those whose lives are spent in smoky and dusty warehouses, are predisposed to it; hereditary delicacy; predisposition to cold, etc.

Symptoms.—Deafness; tinnitus; tuning-fork heard best in the affected ear; pain, deep in the ear and radiating over the side of the head, increased by swallowing, coughing, or sneezing; tenderness in the external meatus, on pressure on the tragus, and over the mastoid; sensation of fulness and weight in the ear; neuralgia; flushed face and hot skin; quick pulse; rise of temperature, etc.; throat and naso-pharynx often inflamed; hollow sound of one's own voice; sometimes a sensation of numbness on the side of the head. Very young children become restless, crying out now and again with pain; the hand is put up to the ear, and they refuse to lie on the affected side; the nose seems stopped from affection of the naso-pharynx and throat. The drum-head is of a pink or deep red colour, with injected vessels and dull appearance; sometimes it bulges, at others it is retracted from obstruction to the Eustachian tube. All these symptoms vary in intensity with the amount of the inflammation.

Bacteriology.—Netter of Paris considers that there are four different forms of acute middle-ear inflammation, each having a special microbe: (1) due to the pyogenic strepto-coccus of Netter, Zaufal, Moos, and Holst; (2) due to the pneumo-coccus of Fränkel, Netter, Zaufal, and others; (3) due to the pneumo-bacillus of Friedländer and Zaufal; (4) due to the pyogenic staphylo-coccus of Fränkel, Simmonds, Rohrer, and Netter.

The form caused by the pyogenic strepto-coccus is most

frequent (Netter), and is most often found in the most serious and life-threatening cases (Zaufal).

All pathogenic microbes found in acute middle-ear inflammation are to be found in the nose, mouth, and pharynx of healthy subjects, and find their way through the Eustachian tubes, thus necessitating antiseptic care in these cavities during the progress of an exanthem. The mechanism of the Eustachian tubes is sufficient, in a perfectly normal condition, to stop the passage of germs, but it is seldom in such a perfect state.

Acute middle-ear inflammation occurring in an otherwise healthy individual, in consequence of a cold is greatly influenced by the pneumo-bacillus of Friedländer, and the diplo-coccus of Fränkel and Weichselbaum.

Prognosis.—Generally favourable; may run on to suppuration, or a thickening of the tympanic mucous membrane, hardening of the mucus with adhesions, ankylosis of the ossicles, etc.

Treatment.—Hot poppy fomentations. Free leeching in front of the tragus, and counter-irritation over the mastoid (a portion of a mustard leaf; liq. epispasticus, or liniment, sinapis co.); gentle inflation by Politzer's bottle, to remove collections of mucus and to prevent adhesions; guaiacum or benzoin vapour by Valsalvan process; warm alkaline nose-wash. Throat and naso-pharynx painted with a solution of chloride of zinc, grs. xxx. ad ℥ j., or nitrate of silver, ʒ ss.—ʒ j. ad ℥ j. As the case is improving, finely powdered boric acid may be blown into the meatus, and the tympanic cavity washed out through the Eustachian catheter with a warm alkaline solution. Saline purges; diaphoretics; non-stimulating diet; no alcohol or tobacco. Change of air to a warm dry place protected from strong winds when convalescing. A warm hop pillow may assist in soothing pain and giving sleep. Paracentesis of the membrane * should be performed if there is much bulging. It will, too, at times relieve pain, even if there is no bulging.

OTITIS HÆMORRHAGICA is described by Roosa. During

* See p. 52.

an attack of acute inflammation, violent pain is complained of and a feeling experienced as if something had given way, and there is hæmorrhage through a perforated membrane.

ACUTE SUPPURATIVE INFLAMMATION.—*Causes.*—Same as those of a simple acute inflammation, an attack of which it usually follows. Sunstroke is said to be a cause, but it is rare.

Symptoms.—Deafness; fulness; and throbbing tinnitus; vertigo; deep-seated and violent pain (in fact, there is no pain more acute than an inflamed and distended tympanum); high fever, frequently commencing with a rigor; double hearing; exaggerated hearing; epileptic fits and vomiting; glands of the neck and mastoid region swollen and tender; may each or all be present. The skin of the meatus is more or less hyperæmic; the drum-head in early cases is slightly convex, with signs of hyperæmia in the more vascular parts; later, gradually loses all its normal features, and becomes more or less swollen, with bulging, usually in the posterior and inferior quadrant, or Shrapnell's membrane. Should a perforation have occurred—and it may do so at any point—a hole varying in size and shape is seen. After perforation, the pain as a rule at once subsides. Acute suppuration may take place without a perforation, the pus discharging through the Eustachian tube.

Prognosis.—In simple forms, if brought early for treatment, favourable, a perforation in a healthy membrane readily healing, if it is not too large, as soon as the acute inflammation has subsided.

In the more severe forms, and in cases that have been neglected, the inflammatory condition may have wrought havoc with the tympanic contents, and the hearing is irretrievably lost. The attack may becomc chronic, and the patient may be exposed to any of the complications of that disease; * or the cranial contents may be more rapidly attacked by the spread of the acute inflammation, and fatal results quickly follow; but this more frequently is the result of an acute inflammation occurring in a case of chronic suppuration.

* See p. 66.

Treatment.—Bear in mind five points—

1. Never underrate the seriousness of the attack.

2. Cases seen early are very amenable to treatment.

3. Cases neglected may have fatal terminations from the complications following a chronic suppuration.

4. Never let your patient cease treatment until the cure is complete, otherwise a slight cold might bring on a serious relapse.

5. The hearing power is the last symptom to get well.

Keep the patient in a quiet room, in bed, if possible, and free from all kinds of work and worry; use hot poppy, boric acid, or lead-and-opium fomentation,* or dry heat from a rubber bag filled with hot water and covered with flannel, or hot hop pillow. Free leeching in front of the tragus; counter-irritation over mastoid. Politzer's inflation, to clear out tympanum and prevent adhesions forming, does not cause pain if gently used; paracentesis of the drum-head should be resorted to if we suspect pent-up pus in the posterior and inferior segment, or at the point of greatest bulging, and the tympanum washed out with the author's intra-tympanic douche. Instillation of cocaine 20 per cent. solution will sometimes relieve pain. Incision over the mastoid and opening antrum may be necessary.

When the inflammation has ceased, and if the perforation is large, the tympanum should be washed out daily by the intra-tympanic douche, with a warm acid solution of perchloride of mercury (1 in 3000, adding tartaric acid 10 grs. to the ounce to acidulate), or a solution of iodic. hydrag.,† same strength, then carefully dry with cotton wool on the cotton-wool holder, the author's ear-shoot and speculum being used while douching. Gently pack the meatus with absorbent wool, piece by piece. If patient cannot attend daily, he should wash out the ear with a warm boric acid lotion in the following manner: 'A sponge should be filled with the liquid to be used, and

* Lead should not be used if the perforation is small, for an albuminate of lead may form in the tympanum, and be difficult to remove.

† Burroughs and Wellcome.

squeezed over the ear, so that the lotion runs down to the membrane and out again, the patient's head being inclined to the opposite side.' After this some boric acid powder, dermatol, or iodoform, should be blown in. Bromides should be given to relieve pain and tinnitus; salines, diaphoretics, etc.

SEROUS INFLAMMATION.—An excessive secretion in the middle ear may be of a serous character.

Symptoms.—More or less deafness, varying according to the amount of serous fluid and the position of the patient; pain seldom present; sound of own voice becomes distressing; movement of the fluid in the tympanum is felt by the patient when he changes his position; the drum-head may bulge and a yellowish fluid may be seen through, which changes its position on movement.

Prognosis.—Guarded; very liable to recur.

Treatment.—Politzer's inflation; Valsalvan inhalation of a guaiacum or iodine vapour; attempt to empty the tympanum by closing the mouth and nose, and swallowing; wash out tympanum with an alkaline or an iodide of potassium wash through the catheter; an alkaline nose-wash. Attention to general health.

If there is much bulging, and the tympanum cannot be emptied, paracentesis must be performed, and the cavity washed out with the intra-tympanic douche; this may have to be repeated several times before a cure is effected.

CHRONIC INFLAMMATION.—*Causes.*—Follows an acute attack; extension of the catarrhal condition of the throat and naso-pharynx, produced by disease, irritation of growths, or injuries; or it may be due to a more or less slow inflammatory process going on in the Eustachian tube and tympanic cavity. An atrophic condition of the drum-head, sometimes seen, is generally due to the upsetting of the balance of aerial equilibrium by the closure of the Eustachian tube; the constant pressure from the outside tending to thin the membrane.

Symptoms.—Deafness, gradually increasing; little or no pain; chronic affection of the throat and naso-pharynx, with dryness and discomfort, and sometimes a sense of fulness

aggravated by atmospheric dampness. Tinnitus and vertigo may be present. The fluid secretions often collect, and are confined to the tympanum through Eustachian closure.

Children often become absent in manner, breathe heavily, snore, have enlarged tonsils and adenoid growths in the naso-pharynx.

The drum-head loses its transparency, is generally concave, of a dull whitish colour, with patchy opacities; calcareous deposits may appear. Its mobility may be impaired by adhesions, ankylosis of the ossicles, or obstruction to their movements by a collection of mucus or a swollen condition of the mucous membrane. Atrophic patches appear as dark spots, or are so transparent that the parts behind can be distinctly seen. The diagnosis of these patches can be easily confirmed by the pneumatic speculum.

Dry Catarrh.*—There is a form of dry catarrh of the middle ear which occurs principally in middle life from syphilis, gout, or rheumatism. The stapes is usually most affected, becoming fixed by adhesions. The Eustachian tubes are patent, and the naso-pharynx and the drum-head are normal in appearance, the deafness is gradually progressive with some tinnitus and vertigo.

Prognosis.—Decidedly unfavourable. In the majority of cases there is no improvement, but under appropriate treatment no further loss of hearing may take place. In those very deaf cases that sometimes hear better when there is a noise, the prognosis is bad.

Treatment.—Politzer's inflation two or three times a week. Valsalvan inhalation of the vapour of chloride of ammonium iodine, especially in the dry form, or guaiacum. Where the Valsalvan method does not do much good, or where the hot steam produces a too-great relaxation of the fauces, a stimulating lotion, such as zinci sulph., grs. v. ad ℥ j., pot. iod., grs. v. ad ℥ j., or a weak alkaline wash, should be used through a Eustachian catheter. Astringent applications to the throat and naso-pharynx, such as zinci chlorid., grs. xxx. ad ℥ j.; ferri

* See also 'Progressive Deafness,' p. 66.

perchlor., ℥ j. ad ℥ j.; or carbolic acid, grs. xx. ad ℥ i. Enlarged tonsils should be excised, and adenoid vegetations removed. Paracentesis is necessary where exudations of mucus behind the drum-head cannot otherwise be got rid of.

Warm nasal douches; tonics; vin. ferri; syrup ferri iodid.; cod-liver oil. Small doses of hydrarg. perchlor., iodide of potassium, nux vomica, chloride of ammonium, are all useful. Bromides in hysterical patients; hydrobromic acid and the bromides for tinnitus; salicylate of soda in rheumatic conditions.

In those cases where the tinnitus is unbearable, and the deafness considerable, Sexton's operation for the removal of the membrane and ossicles may sometimes have a beneficial effect, the tinnitus being relieved, and it sometimes happens that the hearing power is improved.

TENOTOMY OF THE TENSOR TYMPANI.—Has been recommended where the retracted drum-head does not yield readily to inflation; also division of adhesions with a Wredon knife, or rupture by pneumatic traction.

CHRONIC SUPPURATIVE INFLAMMATION. — *Causes.* — Follows an acute attack; * but in some patients, especially ill-nourished children of a strumous or phthisical diathesis, there is no history of pain or a previous acute attack.

Symptoms.—Deafness, usually from impaired aerial conduction; tinnitus and vertigo, due to pressure on the ossicular chain, or the irritation of caries; discharge more or less constant and offensive, ranging in consistency from pale, thin, and watery, often tinged with blood, to thick and creamy; pain, sometimes severe, more especially if the perforation is small and the discharge has not a free vent; more often there is none; tenderness on pressure in front of tragus and over mastoid region; often an eczematous rash and ulceration of lobule from the continuous irritating discharge; cerumen, occasionally mixed with pus and epithelial *débris*, may become impacted, forming a mechanical obstruction to the outlet of the pus, and a focus for pathogenic micrococci; epileptiform attacks may

* Causes of acute attack, see p. 56.

occur, and loss of taste through the chorda tympani being involved. The colour of the membrane ranges from a pale pink to a deep red; polish gone; shining spot disappeared, broken up, or transferred to another place. There may be signs of old cicatrices and deposits of cretaceous matter; a perforation varying from a pin's head to complete destruction of the membrane.

In the latter case, the objects in the internal wall of the tympanum are at times distinctly visible, but the mucous membrane of the tympanum may become swollen and œdematous, resembling a polypus. Carious or necrosed bone can, as a rule, be demonstrated by means of a probe.

Prognosis.—Guarded, as, in the event of the perforation not healing, the hearing power may remain permanently impaired, and, even if healed, the suppurative process may have so damaged the tympanum and its contents as to cause permanent deafness.

Neglect of a chronic suppuration may cause serious and even fatal complications. Patients with a large perforation should have pointed out to them the necessity of care; for a fresh acute attack, started by simply sitting in a draught, might prove fatal.

Treatment.—Extreme cleanliness; antiseptics to destroy pathogenic microbes. Wash out daily with the intra-tympanic syringe, using the warm acid perchloride of mercury solution, or the iodic hydrarg.; carefully dry with absorbent wool. If impossible to see patient daily, direct that the ear be washed out two or three times a day with a warm weak antiseptic lotion, and dried afterwards as much as possible with absorbent wool. If possible to educate the patient's friends up to the syringe, it should be used; if not, a sponge had better be employed. It should be filled with the solution to be used, and squeezed over the meatus, the patient's head being inclined to the opposite side. It is a physical impossibility for patients to properly syringe their own ears. The air-douche through the Eustachian tube, either Politzer or Valsalvan, should be used whilst the washing is going on. The tympanum may be washed out with a warm alkaline solution through the

Eustachian catheter; a curette may be necessary to remove the tenacious matter that sometimes clings to the walls of the cavity. McBride suggests that liq. pancreaticus (Benger), rendered alkaline, should be tried for the same purpose, using afterwards lotions or powders. If lotions, any of the following are useful; but it is impossible to say that any is a specific. What will cure one will have no effect on another; in some any astringent will cause mischief; in others it is necessary to create a considerable amount of irritation. All lotions should be used warm, those not requiring the addition of warm water should have the bottles containing them stood in warm water for a few minutes before using. They should be first dropped into the ear night and morning, gradually reducing as the discharge abates. The patient should be directed to lie down on a couch or bed; the lotion is poured into the ear until the meatus is full, and allowed to soak for ten or fifteen minutes, Valsalvan inflation and its reverse being employed three or four times during this period. Do not forget the direction of the meatus and the manner of straightening it, when giving your instructions. One kind of application should never be continued for any length of time. Remember that great patience and perseverance are necessary on the part of both patient and surgeon to effect a cure.

Lotions.—If the discharge is slight, no fœtor, and no great destruction of membrane: Boric acid, grs. x.—xx. ad ℥ j.

If the discharge is great, and there has been much destruction of membrane: Boric acid, grs. x. to alcohol ℥ j.

If, in addition to the latter, there is much fœtor: Acid sulphurous (1 in 8). No fœtor, and much inflammatory swelling of the tympanic membrane: Acetate of lead, grs. j.—ij. ad ℥ j.

The boric acid and alcohol, and the sulphurous acid lotions should be used at first with equal parts of warm water. Strength then gradually to be increased until it can be borne quite pure without smarting. It is more quickly tolerated this way. Carbolic acid and sulphate of zinc, āā grs. v. ad ℥ j.; pure hazaline; sulphate of zinc, grs. x. ad ℥ j.; sulphate of alum, grs. ij.—iv. ad ℥ j., are all useful, and may be tried if the others

fail. Also an ointment of powdered root of the *Hydrastis Canadensis*, grs. x. to ʒ j. of lanolin, applied on cotton wool.

Powders.—These should be insufflated, after the ear has been thoroughly dried, with the author's intra-tympanic insufflator, or, for want of a better instrument, a quill pen with the feather and point cut off, or a piece of paper rolled into the shape of a blowpipe. A small piece of rubber tubing placed on the end of the quill pen will enable the patient to blow the powder into his own ear. Too much force should not be used when blowing. The powders used are finely powdered boric acid; iodoform (objectionable smell masked by vanilla, menthol, attar of roses, or coffee), iodol, or dermatol, etc.

The swollen mucous membrane of the tympanum should be touched with a solution of nitrate of silver, grs. x.—xx. to ʒ j.; a saturated solution of chromic acid applied with a carrier; the solid nitrate (melted in a platinum crucible, a probe is then dipped in and lightly coated). The crystals of chromic acid or a fine galvano-cautery point lightly applied.

For the relief of pain, leeching in front of the tragus, counter-irritation over the mastoid, or well douching with water as hot as can be borne.

Tonics; cod-liver oil; iodide of potassium, in combination with strychnine or tartarated iron; fresh air; change of climate, if possible. Some cases resist all treatment, fœtor continues, and the mastoid may or may not be tender. For these, at once open the mastoid antrum.* Delay is fully of danger. Antrum is generally full of inspissated stinking caseous pus, which requires some force to dislodge.

PERFORATION OF THE TYMPANIC MEMBRANE.—*Causes.*—An acute or chronic middle-ear suppuration, the pus either bursting through, or an ulcerative process goes on perforating the drum-head; an incision to relieve a distended tympanum; direct violence, forcible and unnecessary syringing, blows on the head, boxing or pulling the ears; the use of ear-picks, hair-pins; foreign bodies in the meatus, and unskilled endeavours to remove them; diving; violent sneezing or coughing; whoop-

* See p. 71.

ing-cough; atmospheric pressure (no man should be allowed to go into an atmosphere in a state of compression, unless he can prove by means of Valsalvan process that the Eustachian tubes are pervious); concussion; irritating applications, such as boiling water, urine, etc.

Rupture of the tympanic membrane from violence, such as a box on the ears, would form good grounds for an action in a court of law.

The membrane may be ruptured at any point, no particular situation being preferred.

Symptoms.—On examination with a speculum, the hole is, generally, readily discovered, though it may be so small and so situated in the anterior portion of the membrane that it cannot always be seen. By using Politzer's or Valsalvan inflation, a minute perforation may be discovered by the bubble of air, or the characteristic rush of air through the perforation will be heard when the auscultation tube is employed.

Prognosis.—Good, if the perforation is small, recent, and clean-cut.

Bad, if large with irregular edges, and there has been much suppuration. If, however, the footplate of the stapes is left in position and not ankylosed, a certain amount of hearing remains, although the other ossicles have been destroyed.

Treatment.—If arising from a burst through of pus, first endeavour to cure cause, then, if cleanliness is observed, the hole will most likely heal of its own accord; if not, the edges must be touched with solid nitrate of silver, or a fine cautery point. If perforation is round, a slight incision at either end may start the healing process.

If ruptured from violence, care must be taken not to injure the wound by too-forcible syringing when washing away a clot, in order to avoid suppuration and a thickened cicatrix.

ARTIFICIAL MEMBRANES.—If the perforation is large, shows no sign of healing, and the ossicles remain intact, an artificial membrane may be used *after all acute inflammation has disappeared* and the discharge has ceased. It is frequently of the greatest assistance to the patient. It should never be

worn too long at a time, and should be removed if it causes any discomfort, and on going to bed. Half an hour at a time is quite long enough to start with, gradually increasing until it can be worn all day.

If the discharge has not quite ceased, wool membranes moistened with some antiseptic should be employed. When first introducing the artificial membrane, gently press in all directions with the forceps or wire until the spot is found which gives the best results, the *modus operandi* being to restore as much as possible the lost tension in the ossicular chain. Patient is quickly taught to introduce them himself.

Yearsley's.—A small pad of absorbent cotton wool, with a fine silk attached, is by far *the best;* it is less likely to cause irritation than the more elaborate ones.

Ward-Cousins's.—Made of compressed cotton, shaped like a conical hat, the apex resting on the remains of the drum-head, the brim fitting the meatus.

The Wick.—A modification of Yearsley's, consists of a wick-shaped piece of cotton wool, pushed down to the membrane.

Toynbee's is an indiarubber disc on a silver wire.

Gruber's.—Indiarubber or linen discs attached to a silk thread.

Field's.—Composed of two discs, one of indiarubber and one of flannel, the intervening space filled with cotton wool.

Blake of Boston uses sized paper placed over the perforation.

Michael suggested a fluid artificial membrane, instilling first medicated glycerine and then collodion, which forms a membranous covering retaining the glycerine in position.

Oiled silk, leather, and dentist's gold-leaf have been recommended. In America skin-grafting has been used, without much success. The membranes made of absorbent wool should be first soaked in a solution of perchloride of mercury (1 in 3000) and allowed to dry. A small quantity of vaseline should be smeared on the part that will be in contact with the remains of the membrane. Spencer of St. Louis impregnates the cotton wool with powdered boric acid.

PROGRESSIVE DEAFNESS.*—A form of deafness occurring generally in the anæmic and debilitated, and in those of a rheumatic and gouty diathesis, more especially when getting on in years.

Symptoms.—Deafness, which comes on gradually and slowly increases until the patient becomes quite deaf; the drum-head is normal and the Eustachian tubes are patent; there is usually some slight congestion of the fauces. Patients often say they hear better in a noise.

Prognosis.—Bad.

Treatment.—Attend to general health, as no particular treatment does much good.

MALIGNANT DISEASES.—Generally, either epithelioma or sarcoma attacks patients suffering from chronic suppurative middle-ear inflammation, the otorrhœa being followed by granulations and fungoid masses, which bleed freely when removed and rapidly recur.

The glands are affected and the facial nerve is often implicated.

When the middle ear is attacked, either primarily or secondarily, it is difficult to diagnose from caries; the best way is to remove a portion of the growth and put it under the microscope.

CHAPTER VI.

COMPLICATIONS OF CHRONIC SUPPURATIVE INFLAMMATION OF THE MIDDLE EAR.

NEGLECT of a chronic suppuration of the middle ear may cause the sufferer not only to become a nuisance to himself and those about him, owing to the offensive discharge, but he may be liable to any of the following serious complications.

Some of these are prejudicial to the hearing power only, whilst others most seriously endanger life itself.

ULCERATION OF THE AURICLE.—*Cause.*—Want of clean-

* See also Dry Catarrh, p. 59.

liness in not washing away an acrid and irritating discharge from the meatus.

Symptoms.—Vary from a slight superficial ulceration to more or less entire destruction of the lobule.

Treatment.—Cleanliness. Soak away crusts and scabs with carbolized oil; dust the surface with powdered iodoform, and then dress with an iodoform and vaseline; a calomel and acetate of lead, grs. āā x., vaseline, ʒ j.—a simple boric acid ointment. The deeper points of ulceration should be touched with the solid nitrate of silver. Impress upon patient's friends the necessity of *removing all scabs before applying the ointments, etc.* Surgical interference, such as paring the edges and bringing them together with pins and sutures, may be necessary to repair extreme damage.

ADHESIONS AND CICATRICES.—The edges of a perforation may adhere to the walls of the tympanum, and cicatricial bands be thrown across the cavity, binding down the membrane.

Treatment.—If recent, rupture by Politzer's inflation or Woakes's pneumatic tractor. If this is not successful, and adhesions are old-standing, endeavour to divide and cut them away with Wredon's knife; or Sexton's operation for the entire removal of the membrane and ossicles may be necessary. Free Politzerization after division.

AURAL POLYPI.—*Nature and Structure.*—May be either Mucous, Fibrous, or Myxomatous.

The Mucous.—The most common form, is soft, glistening, and round; is very vascular, and consists of a delicate loose stroma, in which are round, spindle, and stellate cells and a vascular network; it is covered with an epithelial layer.

The Fibrous.—The next in order of frequency, is firm, elongated, and red; is equally vascular, and consists of dense connective tissue with a few cells amongst the fibres; has a vascular network, and is covered with epithelium.

The Myxomatous.—Very rare, consists of a hyaline stroma, in which is a network of branched stellate cells with nuclei, and a few small round cells scattered about; has a vascular network and an epithelial coat.

Situation.—Upper and inner wall of the tympanum; the membrana tympani; the walls of the external meatus. Polypi growing from the tympanum or the membrane are much more vascular and more sensitive when touched than those from the meatus.

Size.—Vary from a pin's head to one filling up the external meatus, and protruding from it. Usually single and unilateral; may be multiple and bilateral.

Symptoms.—Discharge from meatus; perhaps mixed with blood; usually offensive; if obstruction has occurred, hot and uncomfortable feeling in ear; discharge ceases; great pain and tenderness soon set in.

By Speculum.—A movable tumour whose pedicle is easily discovered by means of a probe; it is sometimes obscured by pus or a swollen condition of the walls of the meatus.

Prognosis.—Guarded; cannot tell what damage the middle ear has received until the tumour has been removed; very liable to recur unless proper treatment has been *persevered* with.

Treatment.—Removal as soon as possible.

If small, by Hinton's ring forceps, alligator forceps, or small ring-knife.

If large, Jarvis's small snare, Blake's modified Wilde's snare.

Free syringing after operating, to bring away any loose portions. The use of hot water to stop hæmorrhage. Hazeline is a useful addition if a further styptic is necessary. It may not be possible to take the whole away at one sitting, and the operation may have to be repeated three or four times. Always operate, or intra-cranial complications may occur from retained pus, etc. *No force must be used.*

The base should be touched with the solid nitrate, chromic acid, or a fine galvano-cautery point.

Insufflation of finely powdered boric acid, the instillation of boric acid, grs. x., sp. rect., ℥ j.; or a sulphurous acid lotion (1 in 8) if there is carious bone, are the best applications for the patient's home use. Pain after removal may be relieved by douching with hot water, or, if very severe, free leeching in front of the tragus, and mastoid counter-irritation.

Great perseverance and attention are absolutely necessary to perfect a cure. The injection of a few drops of the liq. ferri perchlor., or pure alcohol, into the growth has been recommended, when removal has been objected to, and Gruber has successfully used electrolysis.

Anæsthetic.—Cocaine 20 per cent. For children, gas with a whiff of chloroform.

GRANULATIONS.—More common than polypi, to which they are somewhat allied (the larger ones having a distinct epithelial coat, and consisting of round and oval cells in a hyaline stroma interlaced with blood-vessels). The smaller ones have no distinct epithelial coat.

Causes.—Much discharge, and, when formed, the granulations themselves are very instrumental in keeping up that discharge. Very abundant where there is carious bone.

Situation.—The meatus, tympanic membrane, tympanic cavity.

Symptoms.—Soft, round, red growths, varying in size from a pin's head to a pea; very vascular, bleeding freely when touched.

Treatment.—Frequently disappear without any special treatment, or merely the insufflation of powdered boric acid. As a rule, they require some caustic, as nitrate of silver, or chromic acid, or a fine galvano-cautery point. Puncturing the granulations with a fine needle, before applying the caustic, is useful.

Scraping with a sharp spoon is frequently necessary. Hæmorrhage is easily arrested by hot water. The instillation of rectified spirit, either alone or in combination with boric acid or the insufflation of gallic acid, is best for the patient's home use.

Where there is carious bone, its removal or absorption by a sulphurous acid lotion (1 in 8) is necessary.

OSSEOUS TUMOURS.—(*Vide* p. 48.)

MASTOID DISEASE.—Divided into superficial and deep. In the former the periosteal covering, and in the latter the interior of the process, is the part affected.

Causes.—*The superficial variety* may be produced, during an

attack of acute inflammation, from a direct blow. But it more frequently occurs in chronic suppuration, a sudden chill or blow setting up acute periostitis.

Symptoms.—Violent pain; great tenderness; redness and swelling behind the ear coming on suddenly and frequently, extending down the neck and over the side of the head; the whole at times having a distinctly erysipelatous look; the auricle stands out straight from the side of the head; increase of temperature; rigors; frequent pulse; often occurring.

Prognosis.—Good, if taken in time.

Treatment.—Keep patient quiet in bed; leech freely over mastoid, followed by hot fomentations; if cold is preferred, use Leiter's coils; keep tympanic cavity, meatus, and Eustachian tube free. If symptoms are not relieved in twenty-four hours, or the pain, swelling, and inflammation great from the first, the best treatment is free and immediate incision down to the bone, entering the knife at a point about half an inch behind the auricle and on a level with the lower border of the external meatus; cut from below upwards about three inches long, and deep enough to divide the periosteum, evacuating any pus that may be collected.

Bare bone is usually felt and must be freely exposed; any caries well scraped with a sharp spoon, the surface freely syringed with a warm antiseptic lotion, and the wound dressed with a light antiseptic gauze dressing. The wound must be kept open until all dead bone has come away. If the pain after the incision becomes acute, leeches in front of the tragus as a rule speedily relieve it.

Causes.—In the deep variety. Pus pent up in the cells; extension of inflammatory process from the tympanic cavity.

Symptoms.—Pain deep-seated and severe in character, unrelieved by leeching, etc.; some tenderness on firm pressure, and little or no swelling behind the auricle, though these may be as bad as in the superficial variety, and the two conditions may be combined. The cells may become solidified owing to the inflammatory products within ossifying.

Prognosis—Very guarded, the thin walls which partition

off the important structures lying around being liable at any time to become involved.

Treatment.—Hot fomentations; leechings; free vent for the pus by keeping the Eustachian tube and meatus clear, and incising the drum-head, if necessary. A free incision over the mastoid at times relieves urgent symptoms. Saline purges and opium. No time should, however, be wasted over these methods; and if in a few hours there is no great relief, the mastoid antrum should at once be opened.

TO OPEN THE MASTOID CELLS.—INDICATIONS FOR OPERATING.

1. Purulent inflammation with persistent pain unsubdued by incision or other means.

2. Accumulation of pus in the mastoid antrum, with no escape for the same.

3. In cases where we have to fear circumscribed osseous abscess.

4. Suppuration, combined with inflammation of the mastoid process, in which vertigo and headache are developed during the course of the affection (Politzer).

5. When a chronic suppuration of the middle ear resists treatment, the discharge is not great, but offensive.

METHOD OF OPERATING.—Make either a semicircular or crucial incision, from two to three inches long; the centre to be on a level with the upper border of the external meatus, and as close behind the auricle as possible. Carry the incision down to the bone, dividing the periosteum; the cut should be made from below upwards. Peel back the periosteum; stop all hæmorrhage. Open the antrum with a quarter-inch trephine, a Hinton's perforator, mallet and chisel, a gouge, or a sharp spoon, or, in an emergency, an ordinary gimlet. The instrument should be applied at a spot on a level with the upper border, and as close to the posterior wall of the meatus as possible. It should be worked slightly in the direction of the meatus, and a crown of bone taken away to a depth of half an inch; then, if necessary, more room can be made by breaking down the bone with gouge, sharp spoon, or bone forceps. Take great care, and examine

with probe as you go along. Should a fistulous opening exist, a sharp spoon may be all that is necessary. Take away all dead bone you can. Thoroughly wash middle ear with a warm antiseptic lotion; a drainage tube must be inserted—chicken-bone, silver, or a piece of gum elastic catheter that has been made thoroughly antiseptic. A light gauze dressing should be used, and the wound washed out daily until the parts are in a healthy condition. In cases under heading 5, the inspissated pus can be sometimes got at by separating the lining membrane from the posterior wall of the meatus, and opening the antrum through this wall. This should not be done unless the perforation in the drum-head is large.

Anæsthetic.—Gas and ether.

CARIES OF THE TEMPORAL BONE.—Any portion of the bone may be first attacked. But the following is the more common order of frequency:—

1. The mastoid process.
2. Roof of the tympanic cavity.
3. Posterior wall of the external meatus.
4. Plate of bone separating the mastoid cells from the lateral sinus.
5. Floor of the tympanum and posterior wall of the carotid canal.
6. Petrous portion containing labyrinth.

Symptoms.—Where the mischief is deep-seated, there is often great pain, but it is not always present. When the tympanic walls are affected, an abundance of granulation may be thrown out. Fatal hæmorrhage from erosion of the big blood-vessels; facial paralysis, usually permanent; pyæmia or phlebitis may occur, and the cranium and its contents may be attacked. In all cases where the discharge is watery and offensive, there is grave suspicion of caries. The probe, where possible, is the best instrument for making a diagnosis. The disease may occur without a perforation.

Prognosis.—Influenced by age and situation. Young children recover from mischief that could not fail to prove fatal in adults. Disease of the tympanic walls is naturally more serious than of

the mastoid process. Dead bone is often thrown off by an effort of nature, and cases are on record where the whole of the temporal bone has come away without fatal results, and also where the labyrinth has come away entire. Hæmorrhage from the carotid is especially apt to occur when disease is complicated with phthisis.* Phthisis may follow caries, the morbid matter from the tympanum passing down the Eustachian tube, and so infecting the lung.† No life should be taken by an assurance company when caries exists, for even if only the vesicles are involved, there is an element of danger from extension.

Treatment.—Warm antiseptic washes; removal of all carious bone, or its absorption by a sulphurous acid lotion (1 in 8). If a fistulous opening from the mastoid cells exists behind the ear, it should be enlarged, and a warm antiseptic solution syringed through; leeches and opiates to relieve pain; general constitutional treatment. In cases of *necrosis*, Pritchard recommends a decalcifying solution, viz. strong nitric acid, ʒ ij.; water, ℥ vii. ss.; mix, and add glycerine of carbolic acid, ℥ ss. To be used with a glass syringe, with twice the quantity of warm water. It is frequently as well to let the patient know of any danger that exists, and tell him to be on the watch for any serious symptom that may arise, in order to be in a position to meet it without delay. Before doing so, of course take into consideration patient's temperament.

CEREBRAL ABSCESS.—More frequently occurs as the result of middle-ear disease, more especially of tympanic walls,‡ than from any other cause. May be acute or chronic; a well-defined abscess, with a distinct membrane, or a diffused softening; single or multiple. Pus may be inodorous or intensely fœtid, thick and greenish or pale and scarcely purulent.

Situation.—In the temporal lobe, behind a vertical line drawn through a spot just anterior to the tragus; may extend backwards into the occipital lobe, rarely forwards. Pus may be superficial and in direct communication with the diseased bone or deep-seated and separated by healthy brain-substance. In

* Roosa. † M'Ewen. ‡ Toynbee.

the latter, the infecting microbes find their way through veins, arteries, and lymphatics.

Symptoms.—Pain, dull, localized, tendency to increase and become diffused; locality of pain not reliable; percussion over suspected spot sometimes shows great tenderness at actual seat of abscess.

Temperature.—At first high, then drops to sub-normal.

Pulse.—Slow, regular, and full.

Respiration.—Slow, shallow, and regular.

Mental Power.—Slow sluggish cerebration, lethargy, drowsiness, aphasia, amnesia.

Bowels.—Constipation.

Optic Neuritis.—Not constant; more frequent in abscess than any other complication.*

Paralysis.—Facial, may be slight; of sensation and motion, not constant; if they occur, they assist in localizing abscess.

Convulsive Movements.—Not constant.

Rigors, Delirium, and Irritability.—Not constant.

Muddiness of the Skin; Emaciation; Foul Breath; the latter due to stoppage of proper digestive process.†

All these symptoms become normal when abscess is evacuated; but if stupor rapidly passes into coma, death may occur in forty-eight hours.

The abscess may find an opening, and discharge through the external meatus.

Prognosis.—Very guarded.

Treatment.—Endeavour to reach the pus without delay. Patients never recover unless operated upon. Turn down a large semicircular flap of all tissues covering spot selected. Trephine should be applied a quarter of an inch above Reid's base-line (G G, Fig. 21), and same distance behind centre of bony meatus (Barker). An inch and a quarter behind, and an inch and three quarters to two inches above centre of bony meatus (Ambrose, Birmingham). A small trephine should be first used, and a trochar thrust into the brain in different directions until pus is reached. A larger crown of bone should

* M'Ewen. † Barker.

then be removed, the abscess freely opened, irrigated with a warm boric acid solution, a drainage tube inserted, and brought out at the lower part of the flap, which should be

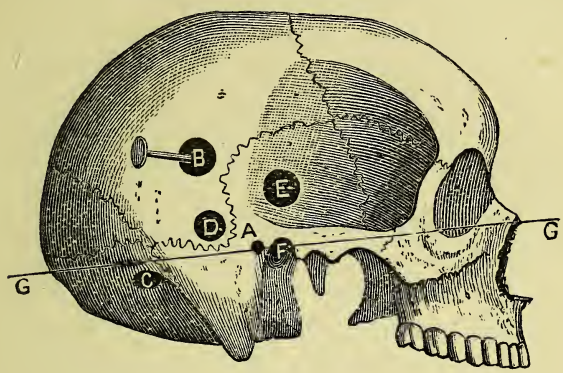


FIG. 21.
Measurements (after Barker).
A. Trephine spot for opening mastoid antrum.
B. ,, ,, cerebral abscess.
C. ,, ,, cerebellar abscess.
D. ,, ,, exposing the lateral sinus.
E. ,, ,, exploring upper surface of petrous bone.
G G. Reid's base-line.

adjusted, and the wound dressed with a light antiseptic gauze dressing. Abscess cavity should be washed out daily until healed. Open mastoid antrum if pus or much dead bone is suspected; remove and drain freely.

Anæsthetic.—Gas and ether.

CEREBELLAR ABSCESS.—More frequently produced by diseases of the mastoid process, external meatus, or petrous bone; same characteristics as to diffusion or limitation, contents of abscess, etc., as the preceding.

Situation.—Anterior portion of one of the lateral hemispheres, where it is in contact with the petrous bone.

Symptoms.—Same as preceding, except that, being frequently complicated with thrombosis, or phlebitis of the lateral sinus, the temperature does not always go to normal when the abscess is evacuated.

A straining backwards of the head and neck may be present. An abscess may form in hemispheres, and give no symptom until pressure is exerted in the peduncles.*

The abscess may find an opening through the mastoid cells.

Prognosis.—Very guarded.

Treatment.—Same as preceding; trephine should be placed an inch and a half behind centre of bony meatus, and a quarter of an inch below Reid's base-line (Barker). Two inches behind centre of bony meatus, and one inch below (Birmingham).

SUBDURAL ABSCESS.—Arises from septic microbes.

1. Having passed through the petroso-squamosal suture and formed pus, this finds its way upwards and backwards over the inner surface of the squamous portion of the temporal bone, and easily perforates the thin bone, already softened by inflammation, usually at a spot about an inch and a half above and behind the external meatus, or, passing through the roof of the tympanum discharges through the meatus.

2. The septic matter may be carried by vessels which perforate the bony partitions between the tympanic and cranial cavities, and form an abscess in the lateral sulcus. The pus may pass through the mastoid foramen and form a superficial mastoid abscess; but more frequently in both cases a diffuse meningitis or a cerebral abscess is set up, or the pus passes into the lateral sinus.

Symptoms.—Vary with the complications that arise; usually a high temperature, with much tenderness and swelling over temporal and mastoid regions.

Prognosis.—Very bad.

Treatment.—Remove bone freely over the affected spot; tap and wash out the abscess antiseptically.

MENINGITIS.—Generally secondary to some other complication; may be simple, and occur within a few days of commencement of otorrhœa. If an intra-cranial complication sets in *early* in a case of otorrhœa, it is probably meningitis. Divided into two varieties—limited and diffused; each due

* See author's 'Otorrhœa and its Complications,' p. 68 (2nd edit.).

to different micro-organisms, conveyed by blood-vessels and lymphatics, or passed through the internal auditory canal from the labyrinth.

Situation.—The *limited:* over tympanic roof; under squamous portion of temporal bone; lateral sulcus; cerebellar region. The *diffuse:* base of brain rather than vertex; spinal membranes may be attacked.

Symptoms.—Sudden onset; rapid course.

Pain.—Sharp and all over head; some cases none at all.

Temperature.—High and steady.

Pulse.—Small, rapid, irregular.

Respiration.—Irregular and increased.

Bowels.—Constipation.

Mental Condition.—Varied. Listlessness; drowsiness and coma, or rigor; delirium and extreme restlessness; aphasia; agraphia; amnesia; convulsions; tremors; twitchings of limbs; hemiplegia; facial paralysis; convergent strabimus; dysphagia; emaciation; retraction of head may or may not be present.

Optic Neuritis.—Not constant.

Prognosis.—Very bad. The most fatal of all intra-cranial complications; more favourable in the limited variety, if operated on early enough.

Treatment.—Not of much avail in the diffuse variety; trephining and boric acid irrigation might be tried; in the limited, trephining over the suspected spot should most certainly be tried.

PHLEBITIS OF THE LATERAL SINUS.—Generally limited in extent; mischief usually confined to the part of the sinus in contact with the inner wall of the mastoid; may spread downwards into the internal jugular and backwards, if thrombosis has taken place.

Symptoms.—Temperature.—Pyæmic; variations not so great.

Respiration.—Increased.

Pulse.—Rapid.

Bowels.—Loose to diarrhœa.

Treatment.—Expose sinus freely by removing bone with a

gouge; open mastoid antrum, and thoroughly irrigate; antiseptic dressings.

THROMBOSIS OF THE LATERAL SINUS.—Occurs directly from necrosis of posterior part of petrous bone, or spreads by the veins from the mastoid cells or posterior wall of the tympanum; spreads downwards into the internal jugular, and backwards to the torcular herophili. Clot may be either tough, with a tendency to obliterate the vessels, and comparatively harmless; or soft, friable, more septic in character, loosely attached to sides of sinus, and liable to be washed into different parts of the body, producing abscesses in liver, lungs, or kidneys, or causing paralysis.

Symptoms.—Onset very sudden; generally a history of long-standing otorrhœa.

Pain.—Acute and lasting (when situated in the posterior triangle, and running down the course of the jugular, it is a valuable diagnostic sign [M'Ewen]); is felt in the affected ear; tenderness over posterior border of the mastoid and below the occipital protuberance; œdema may be present in these places; stiffness in the muscles of the back and side of the head; vomiting repeated day by day.

Temperature.—High.

Pulse.—Rapid.

Respiration.—Frequent.

Bowels.—Loose to diarrhœa.

Giddiness, delirium, or convulsions; rigors; skin, a goose-skin appearance (Barker).

Prognosis.—Fair, if operated on early, and in the tough variety. Very bad, if left, and in the diffuse; death usually taking place in from a fortnight to three weeks, most frequently from pulmonary pyæmia; from meningitis, an abscess in the brain, or general pyæmia.

Treatment.—As early as possible cut down, tie, and divide the jugular vein in the neck, below the level of the clot; then trephine down upon the lateral sinus; apply the instrument an inch behind centre of the bony meatus, and a quarter of an inch above the base-line. When the groove has been opened,

the bone should be either gouged or cut away with forceps; sinus then to be freely incised, and clot and pus washed away. Upper portion of vein should then be opened, and washed out through the sinus; all dead bone carefully removed, and the wound stuffed with antiseptic gauze (Ballance). The vein in the neck is sometimes difficult to find, owing to its attenuated condition.*

PYÆMIA.—May arise from any of the foregoing intra-cranial conditions, or from a simple middle-ear suppuration, fœtor not being necessary for its production.

Symptoms.—Those usual to the disease starting from any other region, such as extreme ranges of temperature occurring at any hour; increased respiration and pulse; sweatings with characteristic odour; recurring rigors; and frequent diarrhœa.

Prognosis.—Very bad.

Treatment.—That usual to the disease. Plenty of fresh air; keep all sources of infection antiseptic by frequent irrigation; open antiseptically all secondary abscesses that may form; quinine in large and repeated doses may do good.

EPILEPSY AND INSANITY.—May follow accumulations of pus in the mastoid.

FACIAL PARALYSIS.—Usually due to the extension of bone-disease from the tympanic cavity, in the direction of the bony canal which surrounds the portio dura in the course through the tympanum. Where the caries is accompanied by profuse suppuration, recovery is not likely to take place.

Prognosis.—Bad.

Treatment.—Little avail.

ALBUMINURIA.—May follow chronic suppuration of the middle ear.

* Dean suggests that in operating for intra-cranial complications the trephine should be placed an inch behind and a quarter of an inch above the external auditory meatus. A part of the lateral sinus and the dura mater just above are exposed; by slightly enlarging the bone upwards with bone forceps, the temporo-sphenoidal lobe can be tapped, and by enlarging downwards the cerebellum can be easily explored.

CHAPTER VII.

DISEASES OF THE INTERNAL EAR.

Diseases of the internal ear are usually of a secondary nature, and arise from constitutional causes, such as fevers, syphilis, inflammation of the meninges, a general lowering of the nervous system, or some upset of the vaso-motor mechanism; from caries of the temporal bone; blows on the head causing effusion into the labyrinth, or partial destruction of its component parts. In many cases there is no trace of injury or disease of the drum-head.

The tuning-fork is the best means of diagnosis.

NERVOUS DEAFNESS. — *Causes.* — Dyspepsia; emotion; general depression; nervous shock from fright or blows; want of activity of the nerves and nerve-centres; prolonged night nursing.

Symptoms.—Deafness, which in the case of shock may be sudden and complete; tinnitus; inability to hear tuning-fork.

Prognosis.—Bad.

Treatment.—Constitutional. Bromides; iodides; nux vomica.

DISEASE OF THE AUDITORY NERVE.—If the auditory nerve in the lower portion of the cochlea is diseased, the perception for high notes will be abolished. If the upper part, the low notes will be affected.

Symptoms.—Deafness; giddiness; tinnitus; fainting; vomiting.

According to Roosa, if the patient has deafness, tinnitus, and no vertigo, the disease is limited to the cochlea portion alone.

Treatment.—In the early stage: leeches; salines; purgatives; counter-irritation over mastoid; bromide of potassium; cod-liver oil.

In chronic cases no treatment is of any good.

INFLAMMATION OF THE LABYRINTH.—Usually produced by the spread of acute or chronic inflammation from the middle ear, but it may occur as a primary affection.

Symptoms.—Marked tinnitus and vertigo; nausea and vomiting; deafness; a deficiency in hearing the tuning-fork conducted through the cranial bones; power of modulating the voice gone.

Prognosis.—Bad.

Treatment. — Complete rest; mastoid counter-irritation; leeching in front of the tragus; large dose of hydrobromic acid.

ARTILLERYMEN AND BOILER-MAKERS are liable to chronic inflammation of the internal ear, coming on gradually, more especially where a middle-ear inflammation or collapse of the Eustachian tubes coexists.

Symptoms.—General deafness and tinnitus; no vertigo.

Treatment.—Prevention, by using cotton wool.

SYPHILIS, HEREDITARY. — Deafness from this cause usually makes its appearance between ten and twenty-five years of age, or later; and is generally preceded or accompanied by chronic keratitis, characteristic teeth. It is usually due to some lesion of the terminal portion of the auditory nerve.

Symptoms.—Deafness, with or without vertigo, according as the whole labyrinth or only the cochlea is involved; comes on rapidly, accompanied by tinnitus, and is sometimes bilateral; the meatus is usually clear; the drum-head white and roughened and looks dry; the tuning-fork is heard imperfectly or not at all. There is a family history.

Prognosis.—Bad.

Treatment.—Anti-syphilitic; mercurial inunction; or pulv. hyd. c. cretæ. In children, the liq. hydrarg. perchlor., ʒ ss., combined with iodide of potassium, commencing with grs. xx. doses and increasing; counter-irritation over the mastoid.

SYPHILIS, ACQUIRED.—Tertiary syphilis sometimes attacks the internal ear. Gummatous deposits may affect the auditory nerve in the labyrinth or brain. Periosteal inflammation may occur.

Symptoms.—Those of inflammation of the internal ear, combined with a syphilitic history.

Treatment.—Anti-syphilitic; iodide of potassium, mercurials. Counter-irritation may do some good.

It is in these cases that the daily injection of pilocarpine is so useful, beginning with $\frac{1}{12}$ gr., and gradually increasing up to gr. j. or more if the patient can stand it. It should be tried for three weeks, and, if improvement takes place, it may be continued as long as there is an increasing improvement in the hearing power, but abandoned if there is no improvement after three weeks.

CEREBRAL TUMOURS.—Usually either fibrous, sarcomatous, or syphilitic gummata; may affect the auditory nerve.

Symptoms.—Pain and throbbing in the head; deafness; tinnitus; periodical attacks of vertigo, falling down at times; fainting; vomiting; optic neuritis; paralysis, etc. Destruction of the auditory nerve is usually preceded by tinnitus.

Treatment.—Treatment is not of much avail except in cases of gummata, where active anti-syphilitic does good.

In the other cases, when the tumour can be located, the skull may be trephined, and an endeavour made to remove it.

AURAL VERTIGO.—Caused by pressure of the air through a perforation; by pressure on the membrana tympani; from violent syringing; wax or a foreign body; by an inflammatory condition of the external ear. According to Weber Liel, this is not true aural vertigo, but is produced by pressure on the stapes.

True Aural Vertigo.—*Causes.*—Occurs usually in debilitated, overworked, anæmic persons, suffering from dyspepsia; from growths or collections of pus or mucus in the cavity of the tympanum; disturbances of equilibrium, due to tubal obstruction by growths or other naso-pharyngeal affections; venous congestion in the sinuses; increase or decrease of labyrinthine pressure; organic mischief in the semicircular canal; vascular and nervous change in the labyrinth; effusion and secondary formation in the labyrinth; cerebral tumours; drugs such as quinine and salicine.

Woakes says, 'The cervical ganglia of the sympathetic play an important part in producing vertigo, especially the inferior cervical ganglion, and the result of functional disturbance in any of the correlated area presided over by the ganglion, is vertigo.'

Symptoms.—Attacks of giddiness come on suddenly, and vary from slight dizziness to actual vertigo, the patient falling with loss of consciousness. Patient may stagger to one side in walking or appear to sink backwards into space. Objects revolve in a definite plane when patient is standing still. They are usually preceded by deafness and tinnitus, cold sweats, nausea, and vomiting.

Patients may suffer from aural vertigo with no defect in the hearing apparatus that can be detected, and, after the attack, the hearing returns and the tinnitus disappears.

Prognosis.—Good, if the ear-mischief producing the symptoms is curable.

Bad, if the contrary.

Treatment.—First find out cause. In cases of pressure from growths or collections of pus or mucus, etc., removal of the cause will remove the vertigo.

For diminished vascular tension: diet; early hours and regular exercise; stoppage of all work; and, if possible, a sea-voyage. Such drugs as quinine, digitalis, iron with either arsenic and strychnine, bromide of potassium, or hydrobromic acid, may do some good.

For deranged liver and stomach, quinine combined with calomel is very useful.

When due to drugs, leave them off.

For effusions and recent secondary formations, intra-tympanic or intra-labyrinthine: to do any good, the treatment must be early. Iodide of potassium, vapor iodi by Valsalvan process, iodine baths, and mercurials if there is any suspicion of syphilis.

For abnormal vascular tension: subcutaneous injections of pilocarpine; counter-irritation to mastoid; and leeching.

MENIÈRE'S DISEASE.—*Causes.*—In the majority of cases no sufficient cause can be assigned. Constitutional disease, such as debility, gout, syphilis, and injuries predispose to its development.

Politzer limits this disease to the sudden apoplectiform attacks of deafness, in which the symptoms of aural vertigo are present.

Roosa limits it to hæmorrhage into the semicircular canals.

Guye of Amsterdam takes in all cases in which a sensation of vertigo is caused by abnomal irritation of the nervous terminal apparatus of the semicircular canals.

Ladroit de Lacharrière limits it to those cases in which there is labyrinthine hæmorrhage.

Symptoms.—Sudden deafness; tinnitus; nausea; vertigo, and inability to walk straight, with a sensation of rotatory movement round a vertical axis towards the affected side; followed before the vertigo is complete by a sensation of rotation about a transverse axis forwards and backwards. The vertigo then becomes complete, and the patient swoons with or without loss of consciousness. Tremulous nature of handwriting in the earlier stages of the disease.

The attacks at the beginning are of brief duration, separated by long intervals, becoming more frequent as the disease progresses, and may finally end in an habitual vertiginous state.

Blindfolding during the more chronic stages will increase the vertigo.

The tuning-fork is not heard.

Prognosis.—Bad, the hearing power being generally completely lost. If taken early, the symptoms may be arrested, the hearing power remaining as it is; but there is always a strong tendency to relapse.

Treatment.—In the Early Stages.—Rest in the horizontal position; counter-irritation over the mastoid; the bromides, with or without ergot; chloride of ammonium, grs. x.; tinct. nux vomic., ♏ xij.; or salicylate of sodium, grs. xv., may do some good.

In the Later Stages.—Leeches over mastoid; iodide of potassium; quinine with caution; bromide of potassium and hydrobromic acid; nitrite of amyl; nitro-glycerine. Politzer recommends the subcutaneous injection of pilocarpine; galvanism.

TINNITUS AURIUM.—Is a symptom, not a disease, characterized by noises in the ears of varying kind and intensity; it may be very slight, but is often of a most distressing nature,

driving the patient to suicide or insanity. It may mean simply a fine piece of dust on the drum-head or a little upset of the liver, or serious trouble either locally or in more distant parts, as the uterus, heart, kidneys, etc.

There is a tendency to progressive deafness in those cases of chronic affection of the middle ear that are accompanied by tinnitus.

Causes.—External Ear.—Blocking of the external auditory meatus with cerumen; foreign body; polypi or granulation tissue; inflammation; eczema; abscess; exostosis; hyperiostosis, etc.

Middle Ear.—Obstruction to, collapse, or closure of the Eustachian tubes; enervation of tubal muscles; pressure on the tympanic membrane; cretaceous deposits in the membrane; rigidity or collapse of the drum-head; adhesions; ankylosis of the ossicles, especially fixure of the stapes; dislocation of the ossicles; abnormal conditions of the tympanic muscles, vessels, or nerves; inspissation of mucus or pus in the tympanic cavity; small tumours, etc.

Internal Ear.—Abnormal conditions of pressure on the nervous expansion in the labyrinth from any cause.

Osseous.—Disease of the osseous structures of the temporal bones.

Nervous.—Cerebral and nervous diseases; tumours; effusions; thrombi; cerebro-spinal disease, which may affect the hearing powers; reflex disturbances; sudden shocks, such as fright, grief, concussion, etc.; mental worry; overstrain from nursing; sleeplessness; constant railway travelling, etc.

Vascular.—Heart-disease; aneurism; extravasation of blood; atheromatous degeneration of the vessels; relaxed arterial walls; abnormal vascular tension, such as anæmia from sudden hæmorrhage or chlorosis, hyperæmia, as in Bright's disease; a watery state of the blood; catamenial disturbances; pregnancy.

Drugs.—Nitro-glycerine; quinine; salicine; tobacco.

Diseases.—Syphilis; gout; hysteria; chronic alcoholism; too-frequent sexual intercourse; seminal emissions.

Climate.—The effects of climate, more especially a residence in the tropics.

Symptoms.—Deafness; vertigo. The peculiar character of tinnitus is very varied, from the soft murmur of the sea-shell to rushing of steam, or heavy hammering, etc. The noise is generally likened to the sound with which the patient is most familiar, or the sound of the sea-shell.* The louder and more defined the noise, the more likely to be due to internal ear mischief. It often disappears in the daytime.

A snapping sound heard by the bystanders as well as the patient is due generally to the sudden drawing away of the anterior from the posterior walls of the Eustachian tubes, from the spasmodic action of the muscles.

A drumming sound is most frequently produced by closure of the Eustachian tubes.

A rushing sound is produced by venous circulation due to congestion of the middle and internal ear.

Ringing of bells, rushing of water, and the murmur of the sea-shell generally indicate some sort of pressure.

Fluid in the tympanum may produce a splashing or bubbling sound.

The dry condition of the tympanic cavity in long-standing cases of middle-ear catarrh, will cause at times a dry, crackling sound.

Prognosis.—Length of time, persistence and character of the noise, must guide us in making a prognosis. This is good in removable causes, such as impaction of cerumen, foreign bodies, etc., provided they have not been left too long.

Bad, when the tuning-fork on the forehead is slightly or not at all heard, and closure of the external auditory meatus makes no difference. Little or no alteration in the appearance of the drum-head. Ankylosis of ossicles, with adhesions, the tinnitus gradually increasing. There is no evidence of effusion

* The following are some of the noises heard by patients: sea-shell buzzing; rustling of trees; rushing of water; humming of bees; rushing of steam; railway engine; machinery in motion; hammering; drumming; thumping; booming; birds singing; whistling; bells ringing; musical sounds, etc.

into the middle ear. Collapse of the Eustachian tubes of long standing. Musical and rushing-water sounds are bad, according to M. Jones.

Treatment.—Removal of cerumen or any foreign body, polypi, etc., relieving any inflammatory conditions of the external meatus, and any pressure on or irritation of the drum-head. Removal of adenoid growths from the naso-phanynx, and attention to any abnormal conditions, inflammatory or otherwise, occurring in these regions. Rectification of nasal irregularities, such as deviated septum, and rhinitis of all kinds. Restoration of aerial equilibration in the middle ear, and securing proper ventilation of that cavity and patency of the Eustachian tubes by Politzer's or Valsalvan inflation with plain air, or the vapour of guaiacum, iodine, or chloride of ammonium. Washing out the tympanic cavity with an alkaline or iodine wash. Systematic suction of the tympanic membrane with a pneumatic speculum, or, in the patient's hands, through a piece of indiarubber tubing fixed to an ear-piece, and, if necessary, incision of the membrane.

In cases of ankylosis of the ossicles with adhesions, Sexton recommends the removal of the drum-head and ossicles.

McKeown recommends painting a relaxed membrane with collodion.

Section of the tensor tympani has been recommended, but is not much in favour.

Faradization and galvanism are not of much use except to restore the function and tone to the tubal and palatal muscles, and at times it aggravates instead of improves the tinnitus. The electrode may be applied in either of the following ways: (1) Over the mastoid. (2) The meatus filled with a solution of salt, and the electrode dipped into this. (3) The electrode applied direct to the drum-head. (4) A fine electrode inserted into the Eustachian tube.

Hydrobromic acid in doses of 25 to 30 mins.; chloride of ammonium; bromides of potassium, ammonium, zinc, and caffeine; hydrobromic ether; ergot; caffeine; hydrobromate of cocaine; hydrastin; nitro-glycerine, especially for the relief

of vascular tension strychnine; arsenic; iron; bromide of iron; quinine; Fellows and Easton's syrups; syrup of the phosphate of iron; Bland's pills as tonics; quinine especially relieves anæmic tinnitus; digitalis and convallaria, vascular tonics have all been recommended, and may do good where indicated. Enonymin, podophyllin, and calomel, followed by salines. Blood-letting may be advisable in some cases of increased tension, and counter-irritation over the mastoid may do good. Glycerine and laudanum applied warm to the meatus. The injection of chloroform vapour and blowing on the drum-head may cause the noise to cease for a time, but it usually quickly returns.

Where possible, a change of climate with a sea-voyage, enforced rest, and cheerful society.

The effects of alcohol and tobacco should be carefully watched.

If there is any gouty tendency, the waters of Rubinat, Æsculap, Hunyadi, Friedrichshal, Carlsbad, Royat, La Bourboule, Kissengen, etc., may be tried.

Mercurials with iodide of potassium; the three iodides, potassium, sodium, and ammonium; or pilocarpine injections, should be tried in syphilitic cases. If the tinnitus is due to uterine, cardiac, dental, etc., causes, the organ affected must, of course, be treated.

AUTOPHONY, or hearing one's own voice, is a symptom in some diseases of the ear, such as—

Loss of tension in the drum-head.

A very patent condition of the Eustachian tubes.

Displacement of the ossicles.

It depends a good deal on the conductive mechanism not conveying the ordinary sounds in the usual manner, but allowing sounds to be heard which are not normally audible.

MALIGNANT DISEASE.—Of a secondary nature.

RHEUMATIC CONDITION OF THE AUDITORY NERVE.—A few cases are recorded in which there is sudden deafness after exposure to cold in one ear, the other being untouched. There was no change noticed in the drum-head; the tuning-fork

was not heard. Iodide of potassium internally, and counter irritation over the mastoid, quickly relieved the symptoms.

DOUBLE HEARING.—This condition, in which sound is heard of a different pitch in one ear to the other, usually occurs in musicians, and exists very often as a symptom of pressure upon the labyrinth from disease of the middle ear, or possibly from independent disease of the labyrinth (Roosa).

CHAPTER VIII.

DISEASES AND INJURIES WHICH MAY AFFECT THE EAR.

ANÆMIA.—There is generally tinnitus; alteration in tension and shape of the drum-head; want of tone in the muscles affecting the Eustachian tubes.

ALCOHOLIC EXCESS.—The deafness may be due to both catarrhal and nervous irritation.

BATHING.—Especially in sea-water, is a frequent cause of inflammation of the tympanum, exostosis in the meatus, etc., caused either by the shock from diving, or from sea-water and its contents taken in at the mouth and nose, getting into the tympanic cavity by the Eustachian tubes, and there causing irritation.

BRIGHT'S DISEASE.—There is increased vascular tension, and may be hæmorrhage into the tympanum, which either becomes absorbed or leads to suppuration.

BRONCHITIS.—Has had middle-ear suppuration assigned to it, most probably produced from the general catarrhal condition, or excessive coughing.

CLIMATE.—A residence in a hot climate sometimes causes deafness and most distressing tinnitus, and often middle-ear inflammation. Dampness of residence too may cause deafness from the spread of catarrhal conditions from the naso-pharynx.

DIPHTHERIA.—May involve the external, middle, or internal ear; there is usually very great pain, more especially with the formation of false membrane; this formation of the

membrane is extremely rare; acute inflammation of the middle ear very commonly accompanies diphtheria; deafness may come on from diphtheritic paralysis. All diphtheritic conditions are very fatal.

DRUGS.—Quinine and salicine produce tinnitus and deafness. These symptoms generally pass off when the drug is discontinued, though permanent deafness may remain after a prolonged use of the drugs.

EPIDEMIC CEREBRO-SPINAL MENINGITIS.—Permanent deafness is a very common sequel to this disease, inflammatory changes being set up in the lining membrane of the vestibule. Semicircular canals and the auditory nerve may be affected.

Roosa says, 'There is congestion and purulent infiltration of the labyrinth and compression of the auditory nerve, the labyrinth being the part most affected.'

Von Tröltsch says, 'Tinnitus is common at the commencement of the attack; there is ear-ache and auditory hallucinations.'

Ziemssen says, 'Deafness is generally bilateral, comes on at any stage—most commonly the third day. Acute suppuration of the middle ear is not uncommon.'

FOREIGN BODIES in the ear may produce mischief, not only *per se*, but from unskilled and forcible attempts to remove them.

GOUT AND RHEUMATISM.—May produce deposits of chalk-stones in the auricle; exostosis of the meatus; irritation of the meatus; cretaceous deposits in the membrana tympani; ankylosis of the ossicles; a gradual thickening of the mucous membrane of the Eustachian tubes and cavity of the tympanum.

HEART-DISEASE.—Causes tinnitus from a disturbance of tension.

HEREDITARY DEAFNESS.—Usually skips one generation, appearing in the next. Prognosis, unfavourable.

INTER-CRANIAL TUMOURS.—Deafness and tinnitus accompany a great many cases of cerebellar, pons, or middle-lobe tumours.

INJURIES AND BLOWS, ETC.—Produce rupture of the

external meatus; rupture of the membrana tympani; hæmorrhage into the middle or internal ear; lesions of the nervous mechanism; a chronic middle-ear suppuration. More than one fatal case has occurred from boxing the ears. One case of middle-ear suppuration was assigned by the mother to the use of instruments at birth.

LEUCÆMIA.—Deafness comes on suddenly; is bilateral; well-marked vertigo; tinnitus; and ocular migraine. It generally ends fatally.

LOCOMOTOR ATAXY.—Erb says, 'There is atrophy of the auditory nerve in some cases.'

Pomeroy says, 'Progressive deafness is common in locomotor ataxy.'

MALARIA.—Causes intermittent aural neuralgia.

The remittent congestive attacks of malaria leave permanent lesions with incurable deafness and tinnitus.

MEASLES.—Middle-ear inflammation, with sometimes chronic suppuration of the tympanum. The Eustachian tubes may be the only part involved. Probably due to the spread of an inflammatory condition of the mucous membrane of the naso-pharynx. In treating, extreme cleanliness should be employed, and the drum-head incised on the first sign of bulging.

MENSTRUAL DISTURBANCES.—More especially at the menopause, and in cases of menorrhagia, may cause ear-trouble from vascular disturbances.

MENTAL WORRY AND NERVOUS SHOCK.—May be a source of deafness and tinnitus, and in the latter case the deafness may be complete and permanent.

MUMPS.—Cause marked deafness, and the labyrinth is at times incurably injured. Vertigo is often complained of.

NASO-PHARYNGEAL CATARRH, ADENOID GROWTHS, ETC.—For deafness arising from these causes, see Chapter XIII.

NEURALGIA OF THE EAR.—Is generally a reflex pain, and is intense in character.

OBESITY.—May cause deafness from pressure.

OCCUPATIONS.—Such as those of artillerymen, boiler-makers, divers, engine-drivers, etc., predispose to deafness. The mem-

brane may be ruptured, or the nervous apparatus disturbed; the former more especially if a chronic middle-ear catarrh pre-exists. Workers in compressed atmospherical conditions, so suffering, should place cotton wool in their ears before beginning their work; the hearing of engine-drivers should be tested, as it is as important as their sight; frequent railway travelling may cause tinnitus; gunners are exposed to the effects of concussion; military campaigning and hard work, when undertaken under varying conditions of climate, and often accompanied with much privation, predispose to ear-trouble. The sound-deadeners of Macnaughton Jones or Ward Cousins are useful to those exposed to concussions, etc.

OLD AGE.—Some people get deaf sooner than others. The deafness is due both to middle and internal ear changes; the cavity of the tympanum, the labyrinth, the auditory nerve, and the nerve-centre itself being affected. The lumen of the external meatus is often blocked by the condyle of the lower jaw thrown back in cases where teeth are lost.

PREGNANCY AND PARTURITION.—The labyrinth may be affected by anæmia or nervous shock. Frequent pregnancies predispose to auditory changes from vascular disturbances.

Pre-existing deafness may become worse.

RELAPSING FEVER.—Acute inflammation of the tympanum, which Luchan says is direct, and not from extension from the throat.

SCARLET FEVER.—Ear-disease is one of the most common complications of scarlet fever, and generally occurs immediately after the cessation of the rash and during desquamation. It takes the form of suppurative inflammation of the middle ear, and there is a perforation of one or both drum-heads. Ears should be carefully attended to during an attack of an exanthem, and treated on the first sign of mischief. Care must be taken during the convalescing stage.

SMALL-POX.—Ears are seldom affected, but Wendt says that pustules are met with in the cartilaginous portion of the external meatus, most frequently near the orifice. There is sometimes middle-ear catarrh with serous exudation and pus.

SYPHILIS.—Gummatous deposits may occur in the auricle; ulceration and condylomata in the external meatus; acute inflammation of the middle ear; closure of the Eustachian tubes from cicatrization of a pharyngeal ulcer, or swelling of the mucous membrane; gummata and periostitis of the internal ear. According to Hinton, deafness may arise from lesion of the terminal portion of the auditory nerve in hereditary syphilis. Primary syphilis of the ear is extremely rare.

SYRINGING.—Useless and forcible syringing will produce ear-trouble. Never syringe on an exposed drum-head, and always look at the ear from time to time when syringing for the removal of cerumen, etc. Always let the first impact of the water strike the concha, and remember that vertigo, fainting fits, etc., may be caused by syringing.

TEETHING.—May cause deafness both from the direct spread of inflammatory conditions from the alveolar structures, the child being frequently out of health at the time, or from reflex dental causes.

TUBERCULOSIS.—Suppuration of the tympanum in phthisical patients occurs without pain, and causes rapid destruction of the tissues with extension to the surrounding parts. The petrous portion of the temporal bone is most liable to be attacked. Hæmorrhage very frequently occurs in these cases (Roosa).

TYPHOID.—Deafness from affections of the Eustachian tubes and middle ear; labyrinthine disease; central nervous disturbance, usually secondary to the tympanic mischief. The deafness is common during the acute stage of the fever, varying with the amount of nervous prostration; it most commonly passes off with convalescence, but some cases remain permanent.

TYPHUS.—Deafness from affections of the Eustachian tubes; acute inflammation of the middle ear; disease of the labyrinth and auditory nerve; a cured otorrhœa will return; usually begins about the end of the first week (Field).

UNCLEANLINESS.—Owing to neglect or ignorance, life as well as hearing may be imperilled from want of cleanliness in

not having cerumen, fungi, or purulent discharges properly looked after and washed away.

URÆMIA.—A common cause of tinnitus from vascular disturbance.

WHOOPING-COUGH.—A common cause of acute ear-disease, from the spread of inflammation by the Eustachian tubes, or from rupture of the membrana tympani during paroxysms of cough.

CHAPTER IX.

DEAF-MUTISM.

DEAF-MUTISM may be divided into congenital and acquired, and is said to be more frequent in males than in females.

Causes.—Consanguineous marriages; hereditary; scrofula; constitutional taint in the parents, such as syphilis, alcoholism, over-suckling; cerebral affections; deafness acquired before learning to speak, or in those who have lost the power of speech; from middle-ear inflammation, produced by the exanthemata, especially scarlet fever; inflammation of the internal ear; throat, nose, and naso-pharyngeal affections; injuries, etc.; congenital malformations.

Test of Deafness in a Young Child.—If a sharp loud noise is suddenly made behind the head, the child, if it hears, will turn its head in that direction; and a vibrating tuning-fork placed on the forehead will generally produce some signs of hearing.

Time to commence Treatment.—The earlier the better.

Signs of ear-disease in mutes should be attended to at once, and the child taught to speak as soon as possible.

Deafness occurring up to seven years old; there is generally dumbness also, after that speech is usually retained, although there are a few instances recorded to the contrary in both cases.

Management of Deaf-mutes.—Kindness combined with firmness. The knowledge of right from wrong taught. Attention

paid to drill. Cultivation of the senses of sight and touch, and the power to hear certain words should be increased. They should be encouraged to articulate and copy sounds. They should have cheerful companionship, and above all, should be removed from home influences to an institution under skilled teachers, where lip-reading is taught.

Methods of Teaching.—GERMAN.—Pure lip-reading.

FRENCH.—Artificial finger alphabet.

OLD ENGLISH.—Combined lips and signs.

CHAPTER X.

SIMULATED DEAFNESS—LIFE INSURANCE, ETC.

MALINGERING is generally unilateral.

MODES OF DETECTION.—Stop the good ear with cotton wool, and afterwards apply the tuning-fork to the head or teeth. The patient will generally state that he does not hear a sound, ignorant of the fact that an obstructed meatus intensifies vibration carried on through the bones (Moss).

If one ear is perfect, even after it has been stopped with cotton wool, a word will be heard if shouted close to the patient; he will often deny his ability to hear a sound (McBride).

Binaural stethoscope so arranged that each branch can be hermetically closed at will. Being unaware of this fact, the patient will be unable to tell what he ought to hear (Coggin).

Blindfold the eyes, and test with watch the hearing distance of both ears repeatedly; the patient's head being moved in different directions. A round leather pin-cushion, the shape of a watch, can be changed for the latter and applied to the ear.

When bilateral, it is much more difficult to detect.

Make the suspected individual repeat again and again the history of his case,—discrepancies will be sure to arise; or give

him an anæsthetic, and take him unawares when he is returning to consciousness (Politzer).

Try to wake the patient when asleep, by a loud noise. Propose some serious operation, intensifying its painful nature, and watch the patient's expression at the time.

LIFE INSURANCE.—Chronic affections of the ear are not in themselves dangerous to life.

Patients sometimes suffer from otorrhœa without knowing it, the discharge being so slight.

When perforations of the drum-head remain permanent after a chronic suppuration has subsided, there is always the danger of a return of the discharge.

A chronic discharge without perforation is very suspicious, and should require a large premium.

A large exostosis should require a very large premium, on account of the danger arising from pent-up discharge.

Chronic otorrhœa with a perforated drum-head should be either refused or a high premium charged, on account of the dangers elsewhere described among the complications of neglected otorrhœa.

If the otorrhœa is combined with pain, granulation tissue, or polypus, the applicant should be rejected, as there is almost sure to be some bone-disease.

Any signs of bone-disease should make rejection necessary.

Auditory vertigo and severe tinnitus, especially in those exposed to any extra amount of danger from falling without warning, should pay a large premium or be rejected.

CHAPTER XI.

AIDS TO HEARING.

In order to have the instrument most suitable to a given case, it is better to try all, and take the one which gives the best result.

The use of the ear-trumpet is to collect waves of sound into the external ear, and to improve resonance.

The best reflectors of sound are METALS, GLASS, PORCELAIN.

Those most commonly used are SILVER-PLATED METALS, ALUMINIUM, JAPANNED IRON, EBONITE.

Certain materials may be objected to on account of their intrinsic notes, weight, fragility.

The hand placed behind the ear increases the auditory capacity, especially for high-pitched notes.

An ordinary conversation tube supplied with a large mouth-piece and placed on a stand in front of the reader's lips, is very useful for reading aloud.

The OTOPHONE.—Increases the receptive capacity of the auricle for sounds by projecting it forward.

Teeth Conductors.—THE AUDIPHONE.—Fan made of vulcanite, and held between the teeth.

The DENTAPHONE.—Consists of a small vulcanite clip connected with a circular vulcanite box by a string.

The TONOMITTOR.—Made of ash wood with a resonating bar attached (Cassells).

Bone Conductors.—ROD OSTEOPHONE. — Transmits sounds directly from the skull of the speaker to that of the deaf person.

ACOUSTIC TRUMPET.—Resembles a stethoscope (Kœnig).

Sound-reflectors.—A small horn-shaped vulcanite tube, the small end inserted into the meatus, the mouth directed backwards towards the concha (Politzer).

The simplest forms are: a hollow cone truncated obliquely, a few holes in the side to stop confusing sounds (Williams).

The aural tubes made by Creswick from cardboard.

Binaural instruments are generally the most satisfactory.

CHAPTER XII.

DISEASES OF THE NOSE AND NASO-PHARYNX CAUSING DEAFNESS.

RHINITIS.—Acute; chronic; hypertrophic; atrophic.

ACUTE.—*Causes.*—Cold; wet; season of the year; sudden changes of temperature; nervous and rheumatic temperament; change of clothing; bodily fatigue; inhaling irritating gases, dust, powders, etc.; in some the internal administration of iodide of potassium.

Symptoms.—At first slight shivering, with rise of temperature; general malaise; sneezing; watery discharges; fulness of head and frontal headache; increased secretion of tears; swollen and red eyelids; some deafness and tinnitus when the Eustachian tubes are involved; the uvula, fauces, and Schneiderian membrane are red and swollen. The smell and taste are lost or impaired. The nose then becomes stopped with a mucopurulent secretion, and the symptoms gradually subside.

The attack generally lasts from a few days to a fortnight or more, occasionally alternating from one side to the other.

Treatment.—Hot foot-bath; warm drinks on retiring to rest; camphor, ammonia, or carbolic acid inhalations; carbolized smelling-salts; inhalation of hot vapor benzoin; nasal injection of boric acid, or cocaine spray 4 per cent. administered with caution; a Turkish bath; anti-febrile mixture, such as quinine, tincture of aconite in 1-min. doses, Dover's powder grs. x.; saline aperients; iodide of potassium in 1-gr. doses every hour; a mixture of bromide of potassium and tincture of belladonna is useful. Powders, snuffs, etc., I do not recommend.

Cause of Deafness.—The Eustachian tubes becoming involved in the catarrhal condition.

CHRONIC.—*Causes.*—Recurrent acute attacks may develop from same cause as the acute, without any previous pronounced acute attack; irritating dust and fumes; temperament; habits, such as snuff-taking, etc.; polypi; adenoid growths; irregularities of the nasal fossæ; syphilis; scrofula, etc.

Symptoms.—Constant discharge of varying consistency; sense

of fulness and frontal headache; chronic redness and swelling of the Schneiderian membrane; sometimes denuded spots on the septum.

Treatment.—Use an alkaline spray to wash away the secretions, and then some astringent lotion, such as boric acid, zinc. sulph., grs. v. ad ʒ j., acid. tannici, grs. ij. ss.—v. ad ʒ j., either by hand-spray, nasal douche, or sniffing. Menthol and paroleine solutions, or warm vaseline and eucalyptol sprays are very useful. Powders, such as bismuth, quinine, and iodoform; salicylic acid and boric acid; bismuth and alum; bougies of iodol., bismuth, acetate of lead; medicated cylinders; cocaine spray, 4 per cent.

I think sniffing is superior to spraying, and spraying to the insufflation of powders.

Cause of Deafness.—The Eustachian tubes becoming involved in the catarrhal condition.

Hypertrophic Rhinitis.—*Cause.*—Recurrent catarrh.

Symptoms.—Swelling, which at times becomes so great as to touch the septum, and completely block the nasal passages. The bones themselves may become enlarged; redness in a more or less degree; sensation of pain and fulness in the lower frontal regions; the smell and taste are usually more or less affected; there may be deafness and tinnitus; and the nasal duct may become obstructed; the tip of the nose sometimes reddens.

Treatment.—Application of chromic acid (saturated solution), galvano-cautery, scarification, or removal of the hypertrophied portion by the snare or cutting forceps; the use of an alkaline nose-wash for home treatment. It is as well to insert a plug of wool after using the cautery for twenty-four hours, to protect the wound. Syrup of the iodide of iron, arsenic, and cod-liver oil, given internally, frequently greatly assist the cure.

Anæsthetic.—Cocaine locally.

Cause of Deafness.—Blocking of the nasal passages, causing an obstruction to the free entrance of air through the Eustachian tubes, or the spread of catarrhal conditions to the Eustachian tubes.

Atrophic Rhinitis.—Generally occurs in strumous, anæmic

patients; is more common in females than males, beginning in childhood or early life.

Symptoms.—A dryness and atrophy of the mucous membrane of the nasal fossæ and the underlying bones. Large crusts form, producing a complete cast of the nasal passages. These rapidly decompose, giving forth an extremely fœtid odour, not noticed by the patient himself. Obstruction in the nose is complained of; offensive discharge; frontal headache; smell lost; nose flattened at the bridge; anterior nares large; a dry glazed atrophic-looking pharynx; dry crusts are sometimes seen about the vocal cords, producing hoarseness and cough.

Treatment.—Thorough washing out to remove all crusts, removal by forceps, if necessary. The surface should then be thoroughly rubbed with a strong solution of chromic or lactic acid. I prefer the latter, commencing with a 40 per cent. solution of the pharmacopœial solution, and increasing up to the latter pure; scarifying the parts well before applying the acid greatly assists. An alkaline nose-wash to be used three or four times a day, succeeded by iodoform insufflations, a menthol and paroleine, or eucalyptol and paroleine spray, or liquid vaseline. Tampon of cotton wool changed three times a day (Gottstein). Galvano-cautery (Fränkel).

NASO-PHARYNGEAL CATARRH.—Two forms: the Moist; the Dry.

The Moist.—*Symptoms.*—The mucous membrane of the posterior wall and vault of the pharynx is swollen and covered with a thick tenacious mucus, grey, yellow, or black in colour; a more or less constant discharge down the throat.

The pharyngeal tonsil and the opening of the Eustachian tubes are swollen, together with the uvula and pillars of the fauces, and the mucous membrane covering the middle turbinate bones. There is comparatively little discomfort.

Treatment.—It is sometimes speedily cured, at others most obstinate, disappearing in dry warm weather, to reappear in the wet and cold; astringent applications to pharynx and fauces; stimulating inhalations; eucalyptol and paroleine spray to be used twice daily.

THE DRY.—*Symptoms.*—In this form there is great discomfort. The throat feels stiff and sore, with a good deal of pain and irritability at times; smell and taste are sometimes lost; there is continuous coughing and hawking to get rid of the mucus; the voice has a peculiar harshness of character; the mucous membrane of the pharynx is dry, shining, atrophied, and covered with a thin yellowish-brown or black mucus and large hardened crusts, frequently combined with atrophic rhinitis.

Treatment.—Carefully remove all secretions with the nasal douche or spray, using an alkaline, a weak permanganate of potash or a chlorinated soda, combined with salicylic acid wash; then some astringent application; carbolic acid, chlorate of potash, or eucalyptus lozenges or pastilles, will moisten the throat; or eucalyptol and paroleine spray; iodoform wool should be worn in the nose after an application. Tonics: syrup of the iodide of iron; arsenic; cod-liver oil—in children, the cod-liver oil combined with syrup. ferri phosph.; fresh air and free ventilation. In syphilitic cases, the taint must have appropriate treatment.

Cause of Deafness.—Implication of the Eustachian tubes, collapse or obstruction.

NASAL POLYPUS.—Grows from the deeper recesses of the nose (Zukerkandl), and at times from the turbinate bones themselves.*

Cause.—Chronic catarrh; injury; a necrosis of the turbinates.

Symptoms.—Stuffiness and inability to breathe through one or both nostrils. On examination a smooth globular glistening pedunculated growth is seen, painless to the touch, and may be multiple or single, unilateral or bilateral.

Treatment.—Removal by snare or galvano-cautery; a galvano-cautery point or a saturated solution of chromic acid to be applied to the pedicle several times after removal. An alkaline nasal wash to be used. If there is much necrosis, removal of the diseased portion with snare or shears.

* This is denied by some authors, but occasionally, when the bone has been removed, the growths can be seen sprouting from it.

No case should be looked upon as cured until three months have passed after treatment has been stopped, without recurrence.

Anæsthetic.—Cocaine locally; but where a piece of bone has to be removed, chloroform.

Cause of Deafness.—Nasal polypus does not, as a rule, cause deafness unless the inferior nasal meatus is invaded.

EXOSTOSES.—*Situation.*—Usually the inferior turbinate bones; more rarely the septum.

Symptoms.—Stuffiness of the nose; swelling and redness of the mucous membrane covering the growth; hard substance felt with a probe; the growth may involve the whole turbinate bone or only a small portion.

Treatment.—Removal by strong curved, blunt-pointed shears or nasal plough. If on the septum, cut away with fine nasal saw, or grind down with dental drill.

Anæsthetic.—Cocaine locally; chloroform, if necessary.

Cause of Deafness.—Blockage of the air-passage.

ENCHONDROMATA.—Usually grow from the septal cartilage.

Symptoms.—A tumour springing from the cartilage of the septum, of which it seems part. It causes deformity, and there is a stuffiness of the nose.

Treatment.—Destroy the growth by galvano-cautery, or remove it with curved shears, gouge, saw, or scalpel, etc.

Anæsthetic.—Cocaine locally, or chloroform.

Cause of Deafness.—Blockage of the nasal passages.

DEVIATION OF THE SEPTUM.—Usually associated with abnormal conditions, the result of injury, tumours, etc. The septum is rarely found perfectly straight.

Symptoms.—A swelling of the septum, with a corresponding hollowing of the other side.

Treatment.—If any is necessary, forcible straightening with Adam's septum forceps, then the application of Adam's septum clamp; or, if in cartilaginous septum only, removal of obstructing portion with scalpel, having first reflected the mucous membrane. It may be necessary to punch a hole in the obstructing portion; this is very rarely required.

Anæsthetic.—Chloroform.

Cause of Deafness.—Obstruction to the nasal passage.

DISLOCATION OF THE SEPTUM.—This sometimes happens from violence or the pressure of a tumour.

Symptoms.—Obstruction to respiration; deformity; extensive deviation.

Treatment.—Remove the cause and straighten the deviation.

Anæsthetic.—Chloroform.

Cause of Deafness.—Obstruction to the nasal passages.

FOREIGN BODIES IN THE NARES.—These might cause deafness from obstructing the air-passages.

CLOSURE OF NOSTRILS.—*Cause.*—Congenital malformations; disease, such as syphilis, small-pox, etc.; accident; a thickened band sometimes stretches across from the inferior turbinate bone to the septum, partially blocking the canal.

Treatment.—Incision, kept open and dilated with oiled lint and sponge tents; in case of a band, cut across with galvano-cautery; chromic acid applied to the cut surfaces will greatly assist in preventing readhesion.

Anæsthetic.—Chloroform; cocaine locally, in case of a band.

Cause of Deafness.—The blocking of the air-passages.

ADENOID GROWTHS IN THE NASO-PHARYNX.—*Situation.*—The vault and posterior wall of the naso-pharynx. They may be few and scattered, or completely fill up the naso-pharynx.

Size.—Vary from a pea to large masses, hanging down and partially visible below the palate.

Most frequently consist of ridges of adenoid tissue descending from the pharyngeal tonsil on the posterior wall of the naso-pharynx, with no independent growths.

Cause.—Chronic nasal catarrh; may be congenital; hereditary; a damp dwelling and atmosphere is conducive to the growth; essentially a disease of childhood, but cases are on record up to the age of thirty-three.*

* When the author's paper on adenoid growths was published in the *Lancet*, giving twenty-eight years as his record for age, he received a letter from a medical man in Australia, saying that he himself, at the age of thirty-three and a half years, had just been operated upon for these growths.

Symptoms.—Those due to the interference of respiration and hearing, such as nasal speech; interference with nasal respiration, producing alteration in the form of the chest-walls, and the air entering chest unwarmed and unfiltered, may sow the seeds of pulmonary disease; the breathing all night with the mouth open dries the teeth, producing caries; snoring at night; peculiar stolid look and characteristic gait; sense of smell and taste blunted or obliterated; a contracted dental arch; high, vaulted palate; deafness, tinnitus, and chronic middle-ear inflammation, simple or suppurative, from pressure on or irritation of the Eustachian orifices. Sometimes the auditory troubles and at others the respiratory ones may be the only symptoms complained of.

Diagnosis.—The growths may be seen by posterior rhinoscopy, but in children this is difficult; the only safe way to avoid error in diagnosis is by making a digital examination.*

Prognosis.—Good, if the growths have not been left too long, and operative measures are used. In no class of cases can a better prognosis be made.

Treatment.—Removal by Gottstein's ring-knife or Woakes's modification of Lowenberg's forceps; I strongly prefer the former, assisted by the bare finger-nail. The knife should be passed behind the soft palate to the vault, and one sweep down the centre and one on each side will, with the assistance of the finger-nail in awkward corners, be all that is necessary. If the forceps are employed, they should be guided to the growth with the fore finger of the opposite hand, and the growth *cut* off, not *torn*. I have seen the mucous membrane covering the back of the vomer brought away, and there is on record a case where a big vein was torn, with fatal consequences, where these precautions were not used. It is as well in both cases to syringe through the nasal passages, to wash away all clots and *débris*, and when doing this the patient should be turned on his side. Hæmorrhage, as a rule, stops as soon as the gag (which, of course, must be used) is removed; if not, the cold water syringed through (to which hazeline may be added, if

* See p. 30.

necessary) is sufficient. Of all the innumerable instruments that have been invented for the removal of these growths, these are the most efficient. In confirmed bleeders, where an operation is impossible, the destruction of the growths by the cautery should be attempted, and for this purpose Lincoln's is the best.

For after-treatment, syringing, with a simple boric acid wash for the first week, and after an alkaline wash.

Constitutional Treatment.—Cod-liver oil; syrup of the iodide of iron; etc.

Try and correct the habit of breathing with the mouth open.

Anæsthetic.—Nitrous oxide gas, and, if necessary, a little chloroform blown over with a Junker.

Cause of Deafness.—Occlusion of, or irritation to, the pharyngeal openings of the Eustachian tubes.

ENLARGED FAUCIAL TONSILS.—Chronic hypertrophy of the tonsil sometimes affects the hearing by causing an obstruction to the Eustachian tubes from chronic thickening of their mucous membrane, or from pressure on the openings.

Treatment.—Amputation with tonsil guillotine; destruction by slowly burning away with the galvano-cautery, or London paste. The powder should be mixed with a little water to the consistency of cream, and carefully applied, a small quantity at a time, the patient freely washing out the mouth with cold water after the application.

Anæsthetic.—Cocaine locally, 20 per cent. solution, or, if necessary, nitrous oxide gas.

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